Quadrimestral | Triannual

Estudos sobre têxteis históricos
Studies in historical textiles

A. Serrano, M. J. Ferreira, E. C. de Groot
(Editoras convidadas | Guest editors)

Conservar Património

31

ARP • Associação Profissional de Conservadores-Restauradores de Portugal

Maio | May **2019**

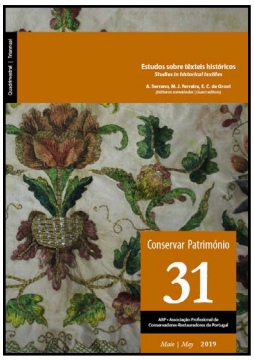
Fotografia da capa | Cover photograph

Anja Smets, Kristel De Vis, Natalie Ortega-Saez, *A challenging treatment of an 18th century embroidered textile using gel cleaning in combination with decamethylcyclopentasiloxane (D5) silicone solvent barriers*, pp. 41-52

Conservar Património

ARP • Associação Profissional de Conservadores-Restauradores de Portugal

Número | Issue 31 *Maio | May 2019*



ISSN 2182-9942

Editorial

Artigos | Articles

Artigos | Articles

Notas | Notes

Conservar Património

ARP • Associação Profissional de Conservadores-Restauradores de Portugal

Revista académica com avaliação por pares
Academic peer-reviewed journal

Paginação | Layout

António João Cruz

Edição, propriedade e redacção | Publisher and editorial office

ARP – Associação Profissional de Conservadores-Restauradores de Portugal
Junta de Freguesia de Santa Isabel
Rua Saraiva de Carvalho, n.º 8, 2.º andar, 1250-234 Lisboa, Portugal
mail@arp.org.pt

Internet

http://revista.arp.org.pt
https://doi.org/10.14568/cp
https://publons.com/journal/36407
https://www.facebook.com/conservarpatrimonio

Comissão de redacção | Copy editing board

Conselho editorial | Editorial board

AATA – Art and Archaeology Technical Abstracts, Getty Conservation Institute
http://aata.getty.edu

BCIN – The Bibliographic Database of the Conservation Information Network, Canadian Heritage Information Network
http://www.bcin.ca

Chemical Abstracts, American Chemical Society
http://www.cas.org

CIRC – Clasificación Integrada de Revistas Científicas, EC3METRICS
https://clasificacioncirc.es

Crossref
https://www.crossref.org

CWTS Journal Indicators, Leiden University
http://www.journalindicators.com

DOAJ – Directory of Open Access Journals
http://www.doaj.org

EBSCO Art Source
https://www.ebscohost.com

ERIH PLUS – European Reference Index for the Humanities and the Social Sciences, Norwegian Social Science Data Services
https://dbh.nsd.uib.no/publiseringskanaler/erihplus/

Google Académico / Google Scholar
http://scholar.google.com

Index Copernicus Journals Master List
http://journals.indexcopernicus.com

Ingenta Connect
http://www.ingentaconnect.com

Latindex – Sistema Regional de Información en Línea para Revistas Científicas de América Latina, el Caribe, España y Portugal
http://www.latindex.unam.mx

MIAR – Matriz de Información para el Análisis de Revistas, Universitat de Barcelona
http://miar.ub.edu

Microsoft Academic
https://academic.microsoft.com

OpenAIRE – Open Access Infrastructure for Research in Europe
https://explore.openaire.eu

Portal de Periódicos da CAPES
http://www.periodicos.capes.gov.br

REDALYC - Red de Revistas Científicas de América Latina y el Caribe, España y Portugal
http://www.redalyc.org

REDIB – Red Iberoamericana de Innovación y Conocimiento Científico
http://www.redib.org

Scimago
http://www.scimagojr.com

Scopus
https://www.scopus.com

Web of Science – Emerging Sources Citation Index (ESCI)
https://webofknowledge.com

O património têxtil e a interdisciplinaridade

Textile heritage and interdisciplinarity

Ana Serrano, Maria João Ferreira, Emmy C. de Groot
Editoras convidadas | Guest editors

António João Cruz
Director | Editor

Nos últimos anos, os têxteis têm vindo a ser cada vez mais valorizados enquanto produtos de um tempo e de sociedades passadas que, nessa condição, reflectem o contexto histórico, social, artístico, económico e político em que foram manufacturados. Extremamente versáteis, os têxteis têm sido essenciais para a vida humana desde tempos primordiais, cumprindo e adaptando-se às mais variadas funções e destinatários. Pelas suas características protectoras, de conforto e revestimento, enquanto obras de arte ou símbolos de estatuto social e poder económico, os têxteis foram sempre tidos em elevada consideração por todas as faixas sociais [1], dada a sua indispensabilidade, a mestria necessária à obtenção e preparação dos materiais necessários, tantos deles dispendiosos, e, subsequentemente, à sua produção. Os processos associados à indústria têxtil eram amiúde os alicerces de comunidades inteiras, dada a complexidade assim como a rendibilidade da sua produção. A procura e a circulação de têxteis atingiu o seu apogeu durante a Idade Moderna, com o estabelecimento de rotas de longo curso, a uma escala global sem precedentes, que vieram enriquecer os mercados locais com as mais sofisticadas produções procedentes de todas as partes do mundo [2, pp. 312-313].

Assim o tem demonstrado um número crescente e diversificado tanto de exposições como de estudos e publicações dedicadas ao mundo dos têxteis, confirmando a actualidade e o potencial do tema. É o caso de catálogos de exposições, obras monográficas ou de âmbito comparado de objectos de sítios arqueológicos

In the last few years, textiles have been increasingly valued as products of specific periods and societies, reflecting the historical, social, artistic, economic and political contexts in which they were manufactured. Exceedingly resourceful, textiles have been essential for human life since time immemorial, being used and adapted in diverse applications and contexts. Due to their protective characteristics, by offering comfort and cover, but also as works of art or symbols of social status and economic power, textiles have been always highly regarded amongst all members of society [1]. Not only were they indispensable, but the inherent craftsmanship for the acquisition and preparation of the materials of which they were made, and subsequently, their production, were labour-consuming and subsequently expensive as well. All processes associated with the textile industry were often the foundations of entire communities, given the complexity and the lucrativeness of their manufacture. The demand and circulation of textiles reached its height during the Early Modern period, with the settlement of long-distance trade routes at a global scale that came to enrich local markets with the most sophisticated manufactures from all over the world [2, pp. 312-313].

This has been demonstrated by an increasing and diversified number of exhibitions, studies and publications dedicated to the field of textiles, confirming the timeliness and potential of this subject. Examples of these are exhibition catalogues, monographs and case studies on objects from archaeological sites or museum,

Conservar Património **31** (2019) 13-15 | https://doi.org/10.14568/cp31fm2 | ISSN 2182-9942
ARP - Associação Profissional de Conservadores-Restauradores de Portugal
http://revista.arp.org.pt

e colecções museológicas, públicas e privadas, cujas investigações subjacentes têm recorrido à observação directa das obras e à sua análise técnico-material a partir de fontes documentais escritas e visuais, no intuito de as contextualizarem sob múltiplos pontos de vista. Mais recentemente, publicações do foro das ciências naturais têm demonstrado ou sublinhado a importância do estudo dos materiais que compõem os objectos têxteis para o conhecimento do seu processo tecnológico e *modus faciendi*, assim como para a sua conservação e preservação a longo prazo.

É cada vez mais evidente a necessidade de aproximar as diversas disciplinas no contexto do estudo do património têxtil. Gradualmente, o conhecimento interdisciplinar em torno dos objectos têxteis começa, inclusive, a contemplar o recurso a métodos de análise química e tecnológica de última geração para fundamentar hipóteses, para as quais as tradicionais fontes históricas disponíveis nem sempre conseguem oferecer respostas conclusivas [3-4].

Essa perspectiva é fundamental para o integral conhecimento desse património e, consequentemente, para o conhecimento de qualquer obra ou objecto, independentemente da sua natureza, que inclua materiais têxteis, bem como para qualquer disciplina, entre as quais a conservação e restauro, que sobre esses objectos incida. Se, como diz Barbara Appelbaum, "the first step of the [conservation] methodology is characterization of the object" [5, p. 3], os artigos que se reúnem no presente volume dedicado a *Estudos sobre Têxteis Históricos*, ainda que, na sua maior parte, não abordem directamente questões de conservação e restauro, são efectivamente importantes para a conservação e restauro por contribuírem significativamente para o conhecimento histórico dos têxteis nas suas componentes material e imaterial e, assim, para o conhecimento que deve alicerçar a primeira etapa metodológica das intervenções e informar os respectivos processos de tomada de decisão.

Este número temático da *Conservar Património*, o primeiro com chamada de artigos e com editores convidados, resulta de uma parceria entre a revista, o grupo de trabalho *Textiles, Trade & Taste: Portugal and the World*, sediado no CHAM – Centro de Humanidades, FCSH, Universidade NOVA de Lisboa, e o grupo de Conservação e Restauro da Universidade de Amesterdão. Assume-se como um ponto de convergência interdisciplinar entre investigações nacionais e internacionais ao nível da actual análise de têxteis históricos nas diversas áreas de história, história da arte, museologia, arqueologia, conservação e restauro e ciências da conservação e integra um total de quinze artigos procedentes de Portugal, Espanha, Bélgica, Reino Unido, Itália, Dinamarca, Estados Unidos e Vaticano que resultaram de uma rigorosa selecção feita pelas editoras convidadas com base nos pareceres efectuados por um numeroso conjunto de pares, de vários países, também eles com formação e interesses diversos.

Este número dedicado a *Estudos sobre Têxteis Históricos*, aproveitando a divulgação da revista resultante

public or private collections. Their investigation comprises their visual, technical and material study based on written and visual sources, with the objective of contextualizing the analysed objects from their multi-dimensional perspectives. More recently, publications in the context of the natural sciences have shown and/or emphasized the importance of the material study of textile objects, in order to reach a wider knowledge about their inherent technological process and *modus faciendi*, as well as about their conservation and preservation on the long term.

Now more than ever, there is an increasingly prominent need for approaching the several disciplines in the context of the study of textile heritage. As a matter of fact, the interdisciplinary knowledge around textiles begins to slowly contemplate the support of methods relying upon analytical chemistry and state-of-the-art technology to substantiate hypotheses, for which traditional historical sources may not always be able to offer conclusive answers [3-4].

This perspective is essential for the holistic insight of the objects, and consequently, for the knowledge about other works of art including comprising textile materials, independently of their nature, but also for other fields of study that dedicate to textiles, namely conservation and restoration. In the words of Barbara Appelbaum, "the first step of the [conservation] methodology is characterization of the object" [5, p. 3]. Hence, and even though the majority of the papers that comprise the present issue dedicated to *Studies in Historical Textiles* do not address directly subjects related to the conservation and restoration of textile objects, they are nonetheless important for their conservation and restoration. They contribute significantly for the textiles' historical understanding in their material and immaterial dimensions, and as a result, for the knowledge that substantiates the first methodological stages of conservation approaches and that supports related decision processes.

The current special issue of *Conservar Património*, the first with a call for papers and invited editors, is a result of a collaboration between the journal, the research group *Textiles, Trade & Taste: Portugal and the World*, based at CHAM – Centro de Humanidades, FCSH, Universidade NOVA de Lisboa, and the group of Conservation and Restoration, University of Amsterdam. This issue is as an interdisciplinary crossover between national and international studies in the present investigation of historical textiles in the several fields of history, art history, museology, archaeology, conservation, restoration and conservation sciences, and it comprises a total of fifteen papers from Portugal, Spain, Belgium, United Kingdom, Italy, Denmark, United States of America and Vatican. The publication of these papers resulted from a thorough selection carried out by the invited editors, following the rigorous evaluation of selected referees, from several countries, and with adequate qualifications and interest within the wide field of textile studies.

By taking advantage of the journal's rich dissemination routes, namely through its indexation in the international

da sua indexação em bases de dados internacionais como a *Scopus* e a *Web of Science* e do seu reconhecimento derivado dos indicadores bibliométricos com números crescentes, visa, pois, contribuir para a valorização dos têxteis históricos nas diversas áreas do conhecimento e encorajar o seu estudo interdisciplinar considerando as suas múltiplas valências.

databases *Scopus* and *Web of Science,* and through its increasing recognition within bibliometric indicators, this issue dedicated to *Studies in Historical Textiles* aims at supporting the appreciation and valorisation of historical textiles in many other areas of knowledge, as well as at encouraging their interdisciplinary study considering their multiple forms and perspectives.

1 Siegelaub, S., *Bibliographica textilia historiae: towards a general bibliography on the history of textiles based on the Library and Archives of the Center for Social Research on Old Textiles [CSROT]*, International General, Amsterdam (1997).

2 Braudel, F., *Civilization and Capitalism 15th-18th Century. The Wheels of Commerce*, vol. 2, University of California Press, Berkeley – Los Angeles (1982).

3 Tímar-Balázsy, Á., Eastop, D. *Chemical Principles of Textile Conservation,* Butterworth-Heinemann, Oxford (1998).

4 Janaway, R., Wyeth, P., *Scientific Analysis of Ancient and Historic Textiles: Informing Preservation, Display and Interpretation: Postprints of the AHRC Research Centre for Textile Conservation and Textile Studies First Annual Conference 13-15 July 2004*, Archetype Publications, London (2005).

5 Appelbaum, B., *Conservation Treatment Methodology*, Butterworth-Heinemann, Oxford (2007).

Editoras convidadas | Guest editors

Ana Serrano
https://orcid.org/0000-0003-2634-3047
Textiles, Trade & Taste, CHAM – Centro de Humanidades, FCSH, Universidade NOVA de Lisboa, Avenida de Berna, 1069-061 Lisboa, Portugal; Cultural Heritage Laboratory, Cultural Heritage Agency of the Netherlands (RCE), P.O. Box 1600, 3800 BP, Amersfoort, The Netherlands

Maria João Ferreira
https://orcid.org/0000-0002-5611-9399
Textiles, Trade & Taste, CHAM – Centro de Humanidades, FCSH, Universidade NOVA de Lisboa, Avenida de Berna, 1069-061 Lisboa, Portugal

Emmy C. de Groot
Programme Conservation and Restoration of Cultural Heritage, University of Amsterdam, Hobbemastraat 22, 1071 ZC Amsterdam, The Netherlands

Estudos sobre têxteis históricos
Studies in historical textiles
A. Serrano, M. J. Ferreira, E. C. de Groot (ed.)

Article / Artigo

Reconsidering dragon carpet origins

Gerald Pollio

Fordham University, London Study Centre, 2 Eyre St Hill, London EC1R 5ET, United Kingdom
gpollio@aol.com

Abstract
Armenians have increasingly been eliminated from the weaving history of the Caucasus. Given that Armenians have lived there for millennia and are its only inhabitants attested in both ancient and medieval sources as having been weavers and dyers, it is surely curious they would have abandoned a craft for which they were renowned. Many regional rugs were originally attributed to Armenian weavers, but from the second quarter of the 20th century onwards were reclassified as being either of Turkish (Azeri) or Persian origin. This article reconsiders the available evidence and the way it has been interpreted to arrive at a balanced assessment of Armenians' contribution to the production of Dragon carpets, the region's earliest surviving design. Its findings challenge many of the assumptions upon which these conclusions were based, and thus revives the possibility the attributions of earlier authors were more accurate than those of their successors.

Keywords
Design origins
Dragon carpets
Caucasus
Armenians
Historiography

Reconsiderando as origens do tapete de dragão

Resumo
O povo arménio tem vindo cada vez mais a ser eliminado da história da tecelagem caucasiana. Dado que os arménios viveram na região durante milénios e são os únicos habitantes reconhecidos como tecelões e tintureiros em fontes da Antiguidade e da Idade Média, é certamente curioso que tenham abandonado uma actividade pela qual foram tão famosos. Inicialmente, muitos tapetes da região foram atribuídos a tecelões arménios, mas, desde o segundo quartel do século XX, foram reclassificados como sendo de origem turca (azeri) ou persa. Este artigo reconsidera a evidência disponível, e o modo como esta tem sido interpretada, para chegar a uma avaliação ponderada sobre a contribuição do povo arménio para a produção de tapetes de dragão, o mais antigo padrão conhecido da região. Os resultados desafiam muitas das suposições sobre as quais têm sido baseadas aquelas conclusões e, deste modo, recupera a possibilidade de as atribuições feitas pelos primeiros autores serem mais rigorosas do que as feitas pelos seus sucessores.

Palavras-chave
Origens de padrões
Tapetes de dragão
Cáucaso
Arménia
Historiografia

ISSN 2182-9942

Conservar Património **31** (2019) 17-30 | https://doi.org/10.14568/cp2018012
ARP - Associação Profissional de Conservadores-Restauradores de Portugal
http://revista.arp.org.pt

Armenians are an ancient people that inhabited an area of the Near East bounded by the Mediterranean and Black Seas and the southern Caucasus. It thus describes the region which from *c.* 600 BCE to the 12th century CE was politically and ethnically Armenian; after that time, although not politically independent, the area was inhabited principally by Armenians until the early part of the 20th century. Whether Armenians constituted part of the region's aboriginal population, or were migrants has yet to be established. It hardly matters: literary evidence confirms they lived in this region for more than two millennia, and if the genetic evidence is credible, even longer than that.

Like the Kurds, who also lived in the Caucasus for centuries, from the standpoint of rug scholarship both have effectively been written out of the region's history; if they did weave rugs, they were invariably kilims or other flat woven textiles intended mainly for personal use, barter or local trade. Commercial production was restricted mainly or entirely to Turks, a rather curious inversion given that nomads would seem to favour smaller and lighter flat weaves over larger and heavier piled carpets. The Turkmen, of course, were transhumants, while the Byzantine (Greek) and Armenian inhabitants of the Caucasus had long been settled and lived in villages and cities.

There are two dimensions to the elimination of Armenians from the region's carpet history. The first has to do with intellectual battles fought in the first half of the 20th century between scholars who, on the one hand, favoured a Turkish origin for the piled carpet and those, on the other, who insisted upon the priority of the Persians. The key implication, of course, is if the Armenians did weave carpets, they could only have learnt the craft from the Turkish invaders or adapted the designs of the more technically and aesthetically advanced Persians. In more recent years, the debate has become increasingly politicised, with attempts made to exclude Armenians from the cultural life of the Caucasus.

With respect to carpets, advocates of this position insist either Armenians never wove carpets [1] or, with the possible exception of Karabagh, that production in Armenia itself is a relatively recent phenomenon, possibly dating back no further than the Soviet era [2, p. 167]. The exception is significant, since recent research relocates the centres of early Caucasian carpet production westwards, closer to regions where historically there was an established Armenian presence. In any event, both positions appear to reflect a point of view first articulated nearly a century ago by Arthur Upham Pope. According to Pope, "there is no record nor even local tradition that rug weaving was ever carried on in Armenia to any extent", and to prove that his views do "not rest on negative criticism only", he cites "one genuine Armenian carpet in existence which holds true to Armenian style' in the collection of a certain Wilhelm Holzman in Berlin" [3, 152].

Pope's shoddy scholarship here is underlined by the fact that his conclusion is based on the specious principle that the absence of evidence is evidence of absence. Even the singular "genuine" Armenian carpet cited is incorrectly attributed as recent research has shown that its in-woven inscription "is not in Armenian, and the 'devices' used in it have no resemblance to illuminations in Armenian manuscripts. All the letters around the border are in Slavonic and Georgian" [4, p. 233]. Neressian provides other examples of mis-identification, many owing to the common practice among Armenian craftsmen of concealing their signatures within the textiles' design elements.

It is unremarkable that textiles of whatever weaving technique have not survived from the period of the Armenian kingdom or from later epochs when Armenians were subservient to invaders from outside the region. There is, however, evidence that carpets were woven in the Caucasus as early as the 7th century BCE. In this regard among the grave goods described in connection with a Neo-Assyrian royal burial is a "rug with a black border" made in Urartu [5, p. 5). It is widely accepted that Armenians were the social and political heirs of the Urartian kingdom but the important point here is that carpet weaving was established in the Armenian Highlands well before there is evidence of the craft being practiced elsewhere. Xenophon, for example, writing in the first quarter of the 4th century BCE, provides the first literary reference to Persian carpets (*Anabasis* vii:3:18; vii:27), while the Pazyryk carpet, the earliest surviving intact piled carpet, attributed by many to Persia and others to Armenia, [6, p. 5; 7, p. 46], is now dated to the late 4th or 3rd century BCE. If anything, the Neo-Assyrian cuneiform tablet adds verisimilitude to claims of an Armenian rather than to a Persian origin.

It is clear that from ancient times the Armenians continued to inhabit their traditional homeland, remained largely Christian, and engaged in global commerce. They lived in villages and cities and were known to weave carpets. Villagers presumably produced carpets mainly for personal consumption, while those living in cities would have woven both for their own use and commercially. Beyond that little else is known of the nature of production, the designs woven, or whether weaving was practised by all the inhabitants of the Caucasus. Even this perspective is too facile: it would be wrong to regard the weavings of Armenian or Greek Christian converts, as undoubtedly occurred, as Islamic when almost certainly their output would have continued to be imbued with their ancestral cultural traditions.

The simple fact is that of all the major population groups that inhabit the Caucasus the Armenians have the longest connection with the region, and are the only ones reported by both ancient and medieval chroniclers as being skilled dyers and weavers. It is inconceivable that Armenians did not historically weave carpets or contribute to the region's common design pool. Indeed, literary sources attest to the fact that Armenians wove carpets from very early times, and continued to do so even

as late as the last quarter of the 15th century. In a Persian manuscript entitled *History of Isfahan* the author, Husain b. Muhammad al-'Alawi, reports that the city's bazaars are "filled with the produce of every clime" after which follows a list of places and their exports, including "carpets and rugs from Armenia" [8, p. 434]. Even so, the earliest extant Caucasian piled weavings, the so-called Dragon carpets (Figure 1), date only from the 16th century and as things presently stand there is considerable disagreement as to whether they are indigenous or imported from Safavid Persia.

For early Caucasian carpets, common practice is to classify them on the basis of their designs. For later weavings "a geographic terminology has evolved, out of the experience of the early carpet trade, which classified rugs into regions according to a combination of design types, and structure features (including length and density of pile and wool quality) with a sub-classification based on the association of certain rug designs with specific towns and villages" [9, p. 96]. Neither approach is satisfactory, the former an admission of an inability to identify objective criteria enabling an agreed attribution, the latter because the classification depends on *dealer lore*, to use Brian Spooner's phrase, where commercial motives would be expected to dominate detached scholarship [10].

Literature review

For many authors, the starting point for their research is the assumption that owing to the mixture of cultures and religions in the region, it probably will never be possible to disentangle the contribution of any particular group [11, p. 28]. They are thus free to introduce additional "controls", often masquerading as conventional wisdom, from which they derive their conclusions.

> [With regard to this class of carpet] we are dealing with weavings from Transcaucasus which have been worked out within the scope of the same factors which have always determined the course of the knotting art in the Near East, be the weavers Christian or Mohammedan. The technique may well have been disseminated as a home industry through the Caucasus area quite early by Turkish tribes and practiced also by Armenians from time to time, without there having been able to influence the stylistic trend. However, whether knotted rugs were specifically meant by the Armenian carpets of some Early Medieval sources is more than questionable; it is much more likely that by this expression were signified the products of the many older weaving methods which have proved outstandingly successful in this very Armeno-Caucasian region, and among which individual techniques such as the Sumak and the Silé had perhaps already been perfected many centuries before. A more precise delineation of the neighbourhood in which these 'Dragon carpets' originated is not possible at this time; reminiscences of their classical phase survive in various categories of Caucasian weavings […] until well into the 19th century [12, pp. 66-67].

Figure 1. Dragon carpet, Armenian or Northwest Persian carpet, 17th century (V&A Museum, London).

Note, in particular, some of the key assumptions embedded in the above argument. The knotting technique is rejected as being indigenous to the region, having instead been introduced "quite early" by invading Turkmen tribes, and practiced only "from time to time" by Armenians. It logically follows that if knotted pile rugs did not feature in the pre-Turkic Caucasus, early sources that mention carpets were obviously misunderstood: the rugs thus referred to were more likely to be those woven using "older weaving methods", such as the two specifically mentioned – Sumak and Silé – both flat woven textiles. Armenians undoubtedly wove pile-less carpets but which, then as now, were intended mainly for personal use; piled carpets, by contrast, were woven primarily for sale. Once these assumptions are relaxed, Bode and Kühnel's argument collapses. By reversing their assumptions, that is, making Armenian weaving practices and traditions anterior to the Turkmen invasions, it would be possible to determine not only "the neighbourhood" in which these carpets were made but also who wove them.

This approach is closer to that adopted by Kendrick and Tattersall. What is especially noteworthy about their perspective is that in an earlier publication Kendrick anticipated Bode and Kühnel's discussion of the difficulty involved in sorting out individual weaving traditions in a multi-ethnic environment: "The chief drawback to the classification [of such rugs] is that characteristics of more than one district are not infrequently combined in a single carpet, and moreover, the tendency of modern times has been towards the effacement of local peculiarities" [13].

> The Armenians were skilled carpet weavers. A race in subjugation, scattered as they were, probably copied the style of districts where they worked. There is a type of design which began to be associated with Armenia twenty years ago, when a carpet with a long Armenian inscription of the 17th century was offered on sale to the [V&A] Museum. The nature of the description alone is not decisive as to the nationality of the craftsman, but the design in this case was distinctive, and there was nothing in its character which argued against a location in the region comprising Armenia, North-West Persia, and the Southern Caucasus. Carpets of the type were probably made in all these districts, but there are advantages to grouping them together as Armenian in origin, and that designation is as near as we can get [14, p. 9].

Without Bode and Kühnel's additional questionable assumptions, others, too, had little hesitation linking Dragon carpets with both Persia and Armenia. For example, Willhelm Valentiner, then-Curator of Decorative Arts, Metropolitan Museum of Arts (New York) had no difficulty ascribing these rugs to Armenian weavers, concluding that Dragon carpets were woven in a production centre "influenced by Persian art, such as was the case with Armenia. Moreover the purple *kirmiz*, which is a colour commonly occurring in these rugs, has always been a favourite dye of Armenian weavers since earliest times. [...] These rugs were imitated in Armenia down to the eighteenth century, but always with small changes in the patterns, especially in the border designs, and with the introduction of more modern decorative motifs" [15, p. x]. Later curators from the same museum reached the identical conclusion. Writing more than a decade later, Breck and Morris, aver that "[a]lthough the influence of Persian models may be discerned in the use of animal motives in the compositional scheme, these carpets are not the work of the skilled Persian weavers. They come in all probability form the looms of a peasant or nomad people [...] [it is] now generally accepted that the home of the 'dragon' rugs is Armenia" [16, p. xxii].

The debate continued into the 1920s and beyond. To be sure, the findings of some studies are more compelling than others, although none have significantly altered the terms of the debate. Indeed, some scholars have gone so far as to assert that because such inscriptions and other Armenian references are all posterior to the earliest Dragon carpets must belie the latter's Armenian origin. The logic of this position, as with Pope's conclusion cited above, is premised on the dubious principle that the absence of evidence is evidence of absence; other scholars, by contrast, sought out examples that based upon structural and aesthetic considerations would affirm the continuing relevance of an Armenian attribution.

Kendrick, for example, in his 1929 article [17, pp. 15-16] sought to extend the range of Armenian weavings beyond the Dragon carpet, discussing two examples then being exhibited at a private gallery in central London, neither of which could be regarded as Dragon carpets but which bear many of their characteristic features (Figures 2a and 2b). Whether derivative (as many scholars claimed) or not, if these carpets could be shown to be of Armenian provenance it would tend to reinforce the traditional attribution of Dragon carpets to Armenian weavers. Kendrick's ascription is based in part on the fact the design of early southern Caucasian carpets often included small crosses and thus indicative of a Christian origin, an interpretation anticipated by Sakisian [18, p. 254], who in connection with one of two Armenian carpets acquired by the Turkish and Islamic Arts Museum in Istanbul detected that at its bottom end there were four crosses, "preuve évidente de fabrication chrétienne et, dans l'espéce, arménienne".

On their own, of course, these cruciform ornaments carry no diagnostic weight; it is only when combined with other characteristics, Armenian inscriptions or dates based on the Armenian calendar or, even Gregorian dates, for example, does their probative value increase. The two carpets studied by Kendrick contain ornamental crosses, which together with two other characteristics – namely, the region in which they were made coincides "with districts bordering on the present-day republic of Armenia", and their design includes the introduction of "crude and diminutive forms of animals" that are familiar characteristics of so-called Kazak rugs – that collectively support an Armenian attribution. In contrast, Kendrick elides the issue of the carpets' dates. The question of the age of an Armenian carpet is not always an easy one. The archaic forms may carry undue weight. In these two examples there are features comparable with some inscribed and dated carpets such as the well-known Gohar carpet dated to 1679-80 (Figure 3).

In a much later study, Willborg [19] extended the geographic range of Armenian weavings, in this instance to southwest Asia Minor. His analysis focused on a group of carpets bearing a close resemblance to the Gohar carpet but which he labels Dragon carpets owing to having found what he regards as dragons incorporated into their designs, a feature not to be found in either the Gohar carpet or the two illustrated by Kendrick. Willborg concludes that his sample was probably woven in Anatolia, more specifically, the Gördes-Demirçi area. "The most likely producers were Armenian settlers from the Caucasus who brought with them the design idea, incorporated some Turkish elements, mostly in the borders, and transformed it all into very beautiful eye catching rugs". Without a known and dated Armenian prototype, the absence of evidence principle would seem to rule out their being of Armenian

Figure 2. South Caucasus (Armenian?) carpets, 18th century (Jekyll's Ltd, London, UK).

manufacture, especially as their structural characteristics suggest an Anatolian provenance.

Finally, attempts have also been made to link design origins with a group of Safavid-style silk embroideries made in the Caucasus ostensibly by Armenian weavers. There are, to be sure, strong affinities between these Safavid-era embroideries and carpets woven, above all, in the Karabagh region. Although the connections are entirely plausible, in the first instance there is no precise way of determining the direction of causation. This fact, however, does not deter Franses from asserting the priority of the latter: "The knotted pile carpets of the 15th to 18th centuries are among the most obvious influences on both the long-stitch embroideries from that region and the tent cross-stitch embroideries [...] attribute[d] neighbouring Shamakhy region in Azerbaijan. There are also design connections between some 16th and 17th century embroideries and knotted pile carpets from northwest Iran" [20, p. 60]. A less contentious position would be to accept that both textile designs are contemporaneous, reflecting the fact both originated in royal workshops and thus drew upon a wide range of potential designs. Here, the Armenian attribution, although possible, appears less convincing, notwithstanding that the Karabagh region has long been recognised as falling within the Armenian cultural ambit.

Figure 3. The Gohar rug (private USA collection).

The fact that workshop designers and weavers may have been Armenian carries little weight since the designs clearly reflect imperial rather than traditional aesthetic values. This conclusion is confirmed by an extremely fine 17th century silk and metal thread embroidered carpet of the Polonaise type made in the reign of Shah Abbas (1588-1629) and signed with the name Yakob, written in uncials concealed in medallions, a practice often found on Armenian artefacts, its hidden position clearly confirms that it was made either in an Armenian workshop or by an Armenian craftsmen; other characters in Armenian script indicate that the carpet was made in 1619 [4, pp. 231-233, figs. 20-21]. On the other hand, it is possible that among provincial copies of these designs weavers may well have incorporated traditional motifs unique to the region's diverse population.

None of these arguments ended the debate, which persisted from that time to the present with both sides reprising old arguments, many devoid of historical, logical or empirical content. "There have probably been more misleading statements about Caucasian rugs than about any other major group, and anyone consulting more than one source is inviting a potent dose of inconsistency and fantasy. While there are surviving rugs thought by many to represent seventeenth and eighteenth-century weavings form the Caucasus, there is virtually no hard information until the late nineteenth century, when a local industry began turning out large numbers of rugs for the market" [21, p. 258].

Alternative possibilities

For present purposes our main interest lies in two issues that are central to the debate, that is, whether Dragon carpets have a unique structure so that they can confidently be assigned to a particular place or region even if, as of the present, it is not possible to identify who actually wove them, and the related issue of whether, as some authors have suggested, in-woven inscriptions provide a sound basis for establishing the ethnicity of the weavers. With respect to the first point, Franses and Pinner [8, p. 97] assert that "the construction of this group indicate they are from one weaving area if not from a single manufacturing centre, but while most known rugs in this family may with confidence be dated to the 18th century, the dating of the earliest of its surviving members is controversial, opinions among scholars varying between the early 16th to the late 17th century. There is historical evidence of the weaving of carpets in the Caucasus some centuries earlier, but nothing is known of their designs".

Several issues raised by Franses and Pinner warrant additional comment. Consider first their assertion that Dragon rugs are so similar in terms of their construction that it is possible to assign them with a high degree of confidence to a particular geographic area, "if not from a single manufacturing area". Not all scholars, however, are prepared to accept the structural uniformity assigned by the authors to these rugs. "Examination of a number of Dragon rugs clearly indicates the likelihood that they were not all woven in the same place. These may be grouped more meaningfully according to their colours, structure and, to a lesser extent, their designs" [22, p. 55].

Whether in-woven inscriptions provide information that can be used to infer ethnicity was pre-figured by Bode and Kühnel. Their comments refer to an inscription contained in a Dragon carpet in the collection of the Textile Museum (Washington, DC). The inscription, written in Arabic letters, bears the name Hussein Beg and a date variously read as 1001 or 1101 AH (1592 or 1689 CE). The authors dismiss the later date, arguing that it is unconvincing as it provides "an improbably late dating", and proceed to argue that the inscription, coupled with the "unmistakably Islamic character of the [carpet's] decorative scheme", clearly "refute the idea that this type of carpet could have been made by an Armenian". As with

their earlier discussion they claim too much while ignoring some obvious difficulties with their arguments. For one thing, the anomalous character of the carpet, above all, its unusual colouration, drawing and imposition of its central medallion on the latticework, and the fact that the palmettes are particularly degenerate [22, p. 60, fn. 12] has led some scholars to conclude it actually is a 19th century Kurdish recreation of a Dragon carpet [23], while others have noted that the "Arabic inscription is so atypical", that it reinforces the suspicion of it being a late copy.

And, finally, Franses and Pinner aver it is unclear where exactly these carpets were made or by whom; they note that Kuba, Armenia and eastern Turkey have all been mentioned as possible venues. However, on the assumption either of inertia or continuity of weaving traditions, they claim it may be possible to narrow the likely location of their manufacture by relating later carpets that closely resemble these earlier types in terms of structure, colouration or the ornaments that feature in their design. Applying this criterion, the authors attribute their production to the Karabagh region "often popularly included among 'Kazak' rugs".

On this, like most others issues connected with Caucasian carpet origins, there is disagreement, although there seems to be a general consensus that owing to their size – the V&A carpet illustrated above measures 350.5 cm × 195.6 cm (11.5 feet × 6.4 feet), others are larger still – and other technical features they are more likely to have been woven in a town or city than in a village; in other words, they are almost certainly commercial products [2, p. 166]. Like Franses and Pinner, Eiland favours Karabagh, and the city of Shusha in particular, because "there is reason to believe the city has long been an Armenian centre" [22, p. 57]; Eiland's second and third choices are, respectively, Gendje and Shemakha.

There is some evidence indicating that weaving was carried out in the Karabagh region in the 16th century. Father Krusinski, a Jesuit priest who lived in Isfahan reported that Shah Abbas established royal workshops in, among other places, Shirvan and Karabagh, notably instructing the *karkhana* (workshop) in each province to "weave in its own manner" [24, p. 2431]. However, it is worth pointing out Father Krusinski resided in Persia *c.* a century after the royal edict was supposedly issued, and although his account is often repeated it has never been independently verified. If there was such an edict, the fact it commanded provincial workshops to weave in the local style would seem to favour the conclusion that Dragon carpets were regionally specific and thus unlikely to reflect court tastes.

Wright and Wertime, contrariwise, argue that "no case can be made for Shusha" as the source of the Dragon carpet. 'The southern part of Karabagh became a separate entity under Nader Shah. [...] Shusha dates back only as far as 1752 when its wall was completed; travellers who visited Shusha in the early 19th century all note its newness. It is a commonplace of Azerbaijan carpet history that Shusha constitutes the 'youngest school' of carpet-weaving. If the Dragon and related floral carpets came from the Shusha area, they would have been made in a rural setting, which is most improbable" [23, p. 26]. While many scholars agree with this conclusion, others claim that Shusha was founded well before then having been an ancient city and fortress in the Principality of Varanda – one of the five autonomous feudal states in historical Nagorno Karabakh – during the Middle Ages and through the 18th century.

Eiland's second and third choices appear equally implausible. With respect to Gendje, even though it is an ancient city, founded in the 8th century CE, it was destroyed in the early 17th century and relocated six kilometres to the southwest [25, p. 93]. And finally, it is true that Armenians appear to have inhabited many villages in the district, including Shemakha, in the vicinity of which were "many monasteries, and where their Bishop lived". There is, moreover, evidence of carpets being made in Shemakha during Safavid times. And while Armenian merchants appear to have been actively involved in this trade, is unclear whether those living in surrounding villages or in the city itself practiced the craft. However, by the early 18th century as a result of political and economic dislocations trade and manufacturing activity in Shemakha appears to have ceased [26, pp. 38, 116], and thus it, too, is an unlikely candidate for being a major centre for the production of Dragon carpets.

The latest proposed location for Dragon carpet origins is Tabriz, notwithstanding that no significant carpet weaving industry existed in the city, the region's capital, or its environs, until the 18th century. According to Wright and Wertime, "Persian sources of the time identify Tabriz as the location of a significant textile industry, including silk weaving. Tabriz was not however among the centres singled out for excellence in carpet production. [...] Carpets were made in Tabriz and its surrounding area between 1702 and 1735, as established by the independent comments of three knowledgeable Europeans" [23, p. 26]. Even if correct, we are asked to accept as reasonable an hypothesis asserting that a carpet with a design inspired by a 17th century Persian prototype was made in a city or region that had no significant rug weaving industry at the time to which it is dated. There is, however, ample evidence that carpets were in fact made in Tabriz well before the 18th century, albeit not necessarily by Turks.

Given the objective of their research Wright and Wertime appear to have limited their focus to the period in which Dragon carpets were made, ignoring other evidence to the contrary as being irrelevant to their argument. However, from both a practical and historical standpoint whether, and when, carpets were woven in Tabriz is important. Continuity of weaving activity would quite obviously strengthen their argument; on the other hand, implicit in their discussion is that Tabrizi weavers were Turks. If, by contrast, it could be shown they were Armenians, Wright and Wertime's preferred location would not be affected, but it would subvert decades of research rejecting that possibility.

The earliest European references stress Tabriz's commercial importance and highlight that the only manufacturing activity then carried on in the city was the production of silk and other luxury textiles, both themes common to the accounts of other Europeans who visited the city between the 13th and 15th centuries [27, p. 261]. It was not until the last quarter of the 15th century that the first European reference to carpet weaving in Tabriz is to be found. Giosafat Barbaro, the Venetian Ambassador to the Persian court, reported in 1473 that the most beautiful carpets, made with both wool and silk yarns, superior in fact to those made in either Cairo or Bursa, were woven there [28, pp. 59-60].

Islamic references to Tabriz are not only significantly earlier than European sources, but confirm that carpets were woven in the city. Ibn Hawqal, the Arab geographer, asserts that carpets were made in Tabriz in the 10th century, the context of his remarks suggesting that Armenians were responsible for their production. "There are made in Marand, Tabriz, Dabil, and the districts of Armenia, Armenian cushions (maka'id) and carpets (ankhakh) known as Armani mahfuir (Armenian carpets with a raised pattern), with scarcely an equal in any place which possesses manufactures resembling these" [29, p. 95]. All three cities are known to have an Armenian connection, the latter being the country's early medieval capital; indeed, Het'um of Corycus, the 13th century Armenian monk and historiographer, claims that Tauris/Tabriz once was part of Armenia [30, chapter 9, p. 14]. The 9th century Persian historian Baladhuri notes additionally that Azdisat, a place near Dabil, was known locally as "kirmiz village", kirmiz being an insect dye widely associated with Armenia [29, p. 95].

The continuing Armenian presence in the city is attested by Jean Baptiste Tavernier, the French gem trader, who made six voyages to Persia between 1630 and 1688, and later authors. Like his European predecessors, he highlights the fact that Tauris/Tabriz is the "mart for Turkie, Muscovy, the Indies and Persia. There are an infinite number of Merchants and vast quantities of all sorts of merchandise [...] Money trolls about in that place more than in any other part of Asia. Many Armenian Families have got great Estates there by Trade, and understand it better than the Persians". He then goes on to enumerate trades practiced in Tauris/Tabriz, but the only textile manufacture carried on in the city is silk weaving, there being more silk weavers "than of any other trade" [31, Book I;4, p. 20). The Armenian reference is noteworthy not only because it indicates that the silk trade, Tabriz's principal industry, was in their hands but also because it confirms their long association with the city.

The same observations are made by John Bell, one of the three "knowledgeable Europeans" cited by Wright and Wertime, who visited the city in 1716. Like his predecessors, he reports that Tabriz had a "considerable commerce in raw-silk, and manufactures of carpets, and silk and cotton stuffs", and that many of its inhabitants were Armenians [32, p. 79]. We are so conditioned to regard Armenians as merchants or traders, the possibility they too may have woven carpets is not even considered, notwithstanding that Wright and Wertime provide evidence that Armenians did make carpets in the Caucasus, and at an earlier date than those reputedly made in Tabriz.

In this latter connection, Wright and Wertime cite Master John Cartwright, a missionary who travelled through Syria and Persia at the beginning of the 17th century, to the effect that Armenians at that time wove carpets in Chiufal (Julfa), Azerbaijan. "At Chiufal we stayed eight days and passed again the River Araxis, leaving the noble kingdom of Armenia, called now Turcomania, because of the Turcomans, a people that came out of Scythia [...] who live as shepherds in their Tents, but the native people (i.e., the Armenians) give themselves to husbandry and other manual sciences as working of Carpets and fine Chamlets" [33, p. 498].

Cartwright's observations establish several important points: the Turkmen were pastoralists, and apparently did not practice weaving or at least there is no mention of their having done so. It seems reasonable to suppose, therefore, the wool from their flocks was sold, most likely to Armenians who, Cartwright reports, did weave carpets and other textiles, while the reference to Julfa establishes that weaving was an urban craft in the Caucasus. He describes the city as being inhabited by "Christians, partly Armenians and partly Georgians; the people rather given to traffic in Silks and other wares whereby it waxes rich and full of money [...] This Town consists of two thousand homes and ten thousand souls" [33, p. 496]. Cartwright's views on both the number of houses and the ethnic composition of the city's Christian population have been challenged, the current view being there were fewer inhabitants and Armenians were its only Christian residents [34, pp. 44-45], and thus the only Christian weavers in the city.

Shortly after Cartwright's visit Shah Abbas, being unable to defend the territory along the Aras River, ordered the evacuation of the town, which was destroyed to prevent the local population and its wealth from falling into the hands of the Ottomans. The residents were forcibly relocated to New Julfa, near Isfahan where, it is claimed, "they worked not as weavers, but as factors for the silk trade and as craftsmen; tombstones indicate that these craftsmen may have included a small number of carpet weavers" [23, p. 20]. It seems very odd that virtually all the relocated inhabitants of the old city, to which must be added Armenians later expelled from Isfahan by Shah Abbas II between 1655 and 1659, suddenly ceased practicing a traditional craft – all the more inexplicable given that carpet weaving was one of a small number of sectors of the Safavid economy with favourable commercial prospects – the sole proof for which is the absence of any reference by 17th century European writers to carpet weaving in the new city.

Despite differences of opinion over the origins of Dragon carpets, and where they were made, there seems

to be a fairly broad acceptance of the fact that Armenians wove piled carpets around the time these carpets make their first appearance, a conclusion endorsed by an earlier generation of distinguished scholars such as Kurt Erdmann and Maurice Dimand, though neither was willing to go beyond that concession; on the question of origins they and others looked elsewhere.

Erdmann, for example, dismisses an Armenian origin on the grounds that Dragon carpets were made after the Armenian kingdom ceased to exist and "the primitive robustness which distinguishes Dragon carpets cannot be attributed [to Armenians] because it is characteristic of the Caucasus in general" [35, p. 153]. Erdmann's comments are not especially compelling as neither of the two reasons cited for dismissing an Armenian origin are convincing. The fact that all extant Dragon carpets are dated to the period after the demise of the Armenian kingdom does not preclude the possibility they, or their precursors, were woven while the kingdom still existed. The significance of their "primitive robustness" as being "characteristic" of Caucasian weavings is equally questionable. Given that Armenians were native to the Caucasus would suggest, contrariwise, that at minimum they contributed to the common design pool or, as others believe, such designs derived principally from Armenian (and Greek) originals.

Dimand, by contrast, is more receptive to an Armenian attribution. Once updated to incorporate later research, his analysis provides even stronger confirmation for that conclusion, notwithstanding his principal motivation was to reconcile competing views on Dragon carpet origins. In agreement with then-existing scholarship, Dimand located the centre of their production in the Kuba region of the eastern Caucasus (that is, Azerbaijan), but conceded that Dragon rugs could have woven by Armenians – and thus likely to have been imbued with the characteristics of their homeland – but with the important caveat that when discussing an Armenian rug what matters is not the geographic location of their manufacture but rather the nationality of the weaver. "Actually the [Armenian and Turkish] attributions are not mutually exclusive if one uses the term 'Armenian' nationally rather than geographically. Armenians dwell in the Kuba region and it is not impossible that they, as well as the Turks, who were also at home in this region, produced such rugs. Caucasian rugs with Armenian inscriptions are known; for example, the floral rug, related to the Dragon rugs, that bears the name of its maker, Guhar, and the date 1679. On the other hand, the late 17th century dragon rug in the Textile Museum bearing the date 1101 (October 1689) and the name of its owner, Husain Beg, has its inscription in Turkish" [36, pp. 266-267]. It is now widely accepted, as noted above, that the Turkish exemplar cited by Dimand to support his argument that Dragon carpets were also woven by Turks was, on the basis of stylistic and other criteria, made instead by Kurds and much later than indicated by its in-woven date.

Dimand's revised analysis provides strong support for Armenian production of Dragon carpets, with the implicit corollary that by incorporating traditional Armenian designs and motifs an indigenous origin is indicated. Others, by contrast, reject such an interpretation insisting instead that such designs must have been imported from outside the region. Turkey has been identified as one such source, a possibility dismissed by Pope who regarded the Turkish contribution as insignificant, insisting instead that whatever merit they may have managed to achieve was due entirely to their contact with the more highly civilised Persians. "The Seljuks and Ottomans might almost be called a cultural extension of Persia. When the Turks swept into Persia they were hardly more than barbarians, but in both literature and the arts they were soon eager pupils of Persian Masters, and from the twelfth century on in the Turkish art of Asia Minor is almost completely under the dominance of Persian ideas and methods" [37, p. 237]. The other, and more widely accepted possibility, is Persia: but if so, how then to explain the transformation from the sophisticated curvilinear designs of Safavid carpets to the coarsely woven, geometric ("primitive") patterns characteristic of Caucasian weaves?

Charles Grant Ellis [38] also regards Dragon carpets as deriving from Persian prototypes originally woven in Kerman in the early 17th century; the fact that many were discovered in Anatolian mosques – but not, significantly, in the mosques of Tabriz from where some claim they originated – explained possibly by the fact their highly abstracted designs were meant to accommodate (Sunni) Muslim religious susceptibilities that proscribe the depiction of living beings or, perhaps, in view of then-ongoing tensions between the Ottomans and Safavids, to disguise their Persian origin. A far simpler explanation was proposed thirty years earlier by A. U. Pope. "Nearly all the important Persian carpets were known and copied there (Eastern and Southern Caucasus region) [...] For the most part the technique was very coarse, so that the fluid designs of the originals took on a certain geometrical rigidity and angularity of outline, but this gave the finest of them, such as the Dragon carpets, an emphatic, challenging force. The weavers, who for the most part, worked without cartoons, as is shown by an analysis of the carpets themselves, contributed a good deal of their own native style, particularly in the rich and intense colour schemes which are distinctly different from the Persian prototypes" [37, pp. 141-142].

A comedy of errors?

Pope concluded that these carpets were made in "Kuba and in some of the surrounding villages principally in the seventeenth century, with somewhat coarsened derivatives in the eighteenth century. By a strange comedy of errors these were, for a long time, thought to be Armenian, a view that has now been generally given up" [37, p. 141-42]. "No weavings of the entire Orient compare in monumental grandeur with these mysterious carpets. Woven probably by tribes of Mongolian descent that drift-

ed into the Caucasus in the thirteenth century they retain from their barbarian origin a strong quality of primitive force" [30, p. 169]. The "comedy of errors" referred to by Pope was elaborated upon in an previous paper [3] that attracted, and continues to attract, critical responses [4, 18, 39-41] for Pope's response to the first of these.

Few, if any, carpets survive from the Timurid era and thus it is impossible to know anything of their structure or designs. Historians have inferred their appearance mainly from illustrated manuscripts, a practice that has been described as "questionable at best", with the surviving parallels for the depiction of rugs in 15th-century Persian painting usually turning out to be Anatolian [42]. Nor is Pope's Kuba attribution acceptable any longer as the town developed only in the late 18th century, while carpets formerly attributed to eastern Daghestan have now been reassigned to the south and west in the urban centres of Karabagh (Shusha) and Shirvan (Shemakha). Karabagh, as noted, contained large numbers of Armenians; their presence was more modest in Shirvan [43, p. 6], although Lynch reports they "were numerous in the town and district" of Shemakha [44, p. 449]. Finally, Muslims accounted for 93 per cent of Shirvan's population, more or less equally divided between sedentary and nomadic families, with half the Muslim population consisting of Kurds [45, p. 195]. Long known for their weaving skills, it is possible that many of the carpets attributed to Turks may in fact have been woven by Kurds.

For other scholars temporal, technical and geographic considerations similarly argue against an Armenian origin. Bell, for example, anticipated Pope's argument that there was no basis for connecting Dragon carpets with Armenia, insisting that its history and geography made it an unsuitable candidate. "Throughout the Middle Ages [Armenia] was broken up into a number of petty kingdoms alternately subject to Byzantium or Persia, Arabs or Turks, and then for brief intervals free. Kurds and Mongols periodically harried these, and even the annexation of the whole country to the empire of the Osmanli Turks brought no cessation of disturbance. Under such circumstances it would be rather remarkable if, despite their position, favourable to the receipt of influences from Persia, the Caucasus and Byzantium, the Armenians had developed any marked style of art. They certainly have not in any other material and it is therefore permissible to doubt if they did in carpet weaving" [46, p. 10].

For Erdmann, it was the Turkmen of the steppe that first introduced piled carpets into the region which perforce means Armenians could not have practiced the craft before then. That, of course, says nothing about the nature of pre-invasion designs: even if it is conceded that Armenians did not originally weave piled carpets there is nothing to prevent them from having subsequently translated their traditional designs from one medium to another. After all, it is not unknown for weavers to transpose flatweave patterns on to piled carpets; the fact that Caucasian designs are distinctive and predominantly geometric lends additional support to the hypothesis.

For Bode and Kühnel, as noted above, Armenian production was confined to flatweaves, that is, textiles meant for personal use, thus reversing the accepted relationship that regards flat woven (pile-less) rugs as the product of nomadic looms and piled carpets the output of sedentary weavers. The fact is most pastoral nomads do not weave pile carpets for their own use. They take too long to complete, are too heavy to carry and thus unsuited to the tasks for which they were purportedly made; moreover, because their looms must be taken apart for transport the size of the carpet that can be woven is limited. Instead, nomads weave flat woven rugs which avoid all of these problems. The sole exceptions are small weavings, bags meant to carry household utensils, such as spoons, or commodities, salt, for example, or as panniers, saddle-rugs or other animal trappings [47].

The direction of causality has, not unexpectedly, been questioned. Azadi, for example, expresses the view that the "European assumption that an art form is generally developed in an ecclesiastical or courtly environment and then imitated with varying degrees of simplification and misunderstanding in more popular settings cannot, however, be applied to study of Persian carpets". In fact, the carpet "was not introduced as a courtly art but was evolved among nomadic peoples at an early date" [48]. The main difficulty with Azadi's argument is that it reverses what is known about the nature of nomadic contact with more advanced urban communities. As Spooner reminds us "from what we know of the cultures of nomadic populations we should not expect them to develop more complex technologies than nearby settled populations [...] There is ample evidence to suggest that nomadic pastoralism throughout the Mediterranean, Mesopotamia and central Asia is culturally derivative of settled life, both in origins and continued interaction" [9, p. 211].

Inevitably, attempts have been made to reconcile these conflicting views. The contribution of different ethnicities or religions has been characterised by Denny as "style in place" or "style in race" and, while the thrust of his argument refers to Anatolia, it could just as easily apply to the Caucasus as the main protagonists were the same in both regions. "Style in place" stresses the importance of pre-Turkish (Greek, Roman, Byzantine and Armenian) influences, while "style in race" refers to the traditions brought by the early 12th century Turkic invaders, including "echoes" of the Islamic influences acquired in Persia and Central Asia. Denny's argument is that these are in reality false distinctions, favouring instead a more syncretistic interpretation that argues for "the important but not exclusive role of the importation [...] of artistic ideas by nomadic tribal Turkic peoples" [49, p. 16].

Possibly, but the more relevant art historical issue is the relative importance of the two ethnographic strands. The impact of Armenians on the textile arts, carpets included, was pervasive throughout the Near East, a conclusion attested by numerous references in early Islamic sources [29]. The evidence for the impact of the Turkish invaders

is more equivocal: there are few if any carpets that can be securely dated before the 15th century; even among those that are so classified, there is disagreement as to whether they are the products of Turkish or Armenian looms [40].

If correct, the idea that the Caucasian weaving tradition prior to the Turkic invasions was uniquely one of flat woven carpets would have to be rejected. In which case, "most of the crafts of village life with the exception of certain techniques of animal husbandry must have been learnt by the newcomers from the native inhabitants" [50, p. 27]. The nomad

> is a cultural satellite of agricultural settlements, markets and cities, because he needs grain – more than he can grow himself, even if he does cultivate some. There is no independent nomadic cultural tradition. At times of political success the nomad apes the political institutions of the cities. […] Not even pastoralism is a monopoly of nomads. In fact, the most significant cultural criterion for a general definition of the term "nomad" is ideological: a man is a nomad because he says he is. The primary function of this ideology would seem to be that it distinguishes its followers from the inhabitants of villages and cities and gives them an identity that they do not otherwise have [51, p. 261].

In short, the newcomers must have learnt commercial weaving from the pre-Turkic Christian population, mainly Greeks and Armenians, who from various European and Islamic accounts were known to have practiced the craft from very ancient times. In this connection there is evidence that silk textiles – "some [of which] were plain, others figured or cloths of gold, with designs similar to those of 'Tartar'" – produced from the 13th century onwards in Tarsus, in Cilician Armenia were usually described in European inventories as *pannus tarsicus*, *pannus de Tarsico*, *de Tars'*, or *de Tarsen*, but could also be listed as *de opera de Turky* (1315) or as *de pann de Tarsen & Turky* (1311-1333): "[i]t is obvious that in these cases Turkey stands for Asia Minor" [52, p. 233]. It should thus be clear the descriptor Turkish or Turk should not automatically be taken to refer uniquely to Seljuks or Ottomans.

For a long time thereafter, non-Muslims constituted a majority of the population in Anatolia and the Caucasus. Even where the indigenous population converted, undoubtedly a significant input into the Islamisation of the region, there is no reason to suppose they abandoned traditional values; the fact that many villages converted *en masse* would tend to reinforce cultural continuity. "Just as in the northern zone of peripheral mountains there still exist whole districts of which the inhabitants have adopted the Mohammedan religion, but retain their affinity to the Greek race to which they belong, so within the statistical tableland of among the ranks of Mussulmans may be found considerable aggregates of people, who although of Armenian origin, profess the dominant creed" [43, p. 417]. It is thus arguable whether a distinctive Islamic patrimony existed. With regard to Asia Minor, "the Ottoman state adopted so much from the Byzantine Empire that it supplanted in Anatolia (even appointing some court personnel), that the Ottoman hybrid incorporated much of Byzantine and pre-Anatolian culture" [53, p. 73].

The Caucasus is unlikely to have been an exception, though wedged between the Ottoman and Safavid empires local inhabitants were exposed to two distinctive artistic traditions. It seems reasonable to assume that carpets intended for personal use or barter continued to reflect traditional designs, which are unlikely to have remained completely unaffected by new artistic currents; commercial products, by contrast, would almost certainly reflect patterns favoured by the market, whichever direction they emanated from. Unfortunately, too little is known about the extent of commercial production in pre-19th century Caucasia. It is virtually axiomatic that carpet weaving there was largely cottage based, both historically and in the 19th century when they first began to appear in large numbers in Western markets. The bulk of the region's population, Armenians included, were peasants living mainly in villages [54, p. 68]. Carpet workshops, whether extensions of home based production or independently organised, existed in many of the region's towns and commercial centres. By then official initiatives were introduced to enhance their commercial acceptability, which undoubtedly affected both their character and appearance, the extent to which is still being debated.

The best evidence favouring this perspective was provided centuries ago by Marco Polo, who reported that the "finest and most beautifully coloured carpets in the world" (e*t ibi fiunt soriani et tapeti pulchriores de mundo et pulchrioris coloris)* were made in central Anatolia by Greeks and Armenians, "who reside in the cities [...] and gain their living by commerce and manufacturing" [55, chapter 3]. The specific geographic context within which Marco's remarks were set was Turkomania, which Yule identifies as embracing "a great part of Asia Minor [but especially] the decaying Seljukian monarchy, usually then called *Rum*, as the Ottoman Empire is now" [55, p. 40]. It is, however, clear from Marco's account that Turkomania covers a much a more restricted area. For one thing, from the way his chapters are arranged, Turkomania is situated between Lesser [55, chapter 2] and Greater Armenia [55, chapter 4]. It is thus to be located in an area corresponding to the six eastern Ottoman provinces that later formed Turkish Armenia. Moreover, it is clear from Marco's use of the term that Turkmen was meant to distinguish pastoral nomads from sedentary Turks, confirmed by the fact that he begins his narrative by noting that the Turkmen "dwell among mountains and downs where they find good pasture, for their occupation is cattle-keeping. Excellent horses [...] are reared in their country, and also very valuable mules".

This distinction was widely accepted among Marco's European contemporaries, for whom the descriptor "Turkmen" was invariably used to describe pastoral nomads, in contrast to "Turk", which equally consistently

referred to the settled rural and urban population of Anatolia. For William of Tyre, for example, "there may be some distinction, at least in name, between those who made themselves a king, and thus achieved such glory, and those who still abide in their primitive barbarism and adhere to their old way of life, the former are nowadays termed *Turks*, the latter by their old name of *Turkomans*" [55, Book I, Chaper 2] The distinction, furthermore, persisted over many generations:

> Another part of Armenia, which belongs only to the Turks, is inhabited by Turkmen, who gave it their name. Tartars, and going further back, those of Hun origin, lived in the Turkmen region of Tartary, which they left in the 11th century seeking other lands. After departing, some established themselves in the western part of Greater Armenia, along the length of the Euphrates River, to which they gave their name. They became subjects of the Turks, who gave them only the shadow of liberty. They continue to occupy the most beautiful countryside along the Euphrates, where they live in almost exactly the same way as when they first established themselves there. Although the governance arrangements, manners and customs of the Turkmen differ from those of the Armenians, they could truly be considered only a sub-division of Armenia [56, p. 4]

It is thus clear that Marco understood Turkomania to be the land that formed the western part of the Greater Armenian kingdom much of which had been reduced to pasture where nomad herds grazed. Only three types of herded animals are noted by Marco, cattle, horses and mules; there is no mention of sheep, as would be expected if Turkmen were responsible for introducing carpet weaving into Asia Minor. Moreover, since antiquity the region around Konya in antiquity was known to have produced wool [57, p. 235].

What appears to have changed in the Seljuk era was the scale on which pastoralism was practiced. While such actions were designed to perpetuate the State, they clearly were inimical to the growth of commerce and other mercantile activity [58, p. 77), which although curtailed remained primarily (or exclusively) in the hands of the indigenous population who continued to live in the region's former great cities where, among other things, they continued to weave carpets. The fact that Marco makes no mention of carpet weaving among the pastoral nomads would seem to confirm that it was then regarded as an urban occupation confined to the Greeks and Armenians then living there.

There is, finally, the possibility that a design dating from this era may have been incorporated in a fresco panel *The Christmas Mass at Greccio* painted by Giotto in the Basilica of St Francis in Assisi. Brüggemann [59, pp. 379-drawing 2, 390] maintains the carpet's eight pointed design depicted in Giotto's panel "could in fact be one of the handful of Rum-Seljuk carpet patterns which we would have to classify as being older then the venerable carpets found from Konya and Beyşehir", the latter regarded by some as among the oldest surviving examples of Turkish weaving. There is, however, the (unsupported) assumption that these designs must be of Turkish origin; the possibility they may have been adapted from indigenous (that is, Greek or Armenian) patterns is never considered, notwithstanding that would appear to be the more likely option.

Conclusion

Armenians are among the Caucasus' oldest inhabitants and the only ones to have a long tradition of dyeing and weaving carpets, while literary evidence from both Islamic and Western sources attests to their very high quality. By the late Middle Ages, Armenia – no longer an independent polity inhabiting a geographic backwater contested by the then-leading imperial powers – was of no further concern either to Islamic or European observers. It is unsurprising therefore that from the 16th century onwards there are only a few scattered comments as to their dyeing or weaving skills. European references, where they occurred, were confined more or less exclusively to their being merchants and traders and to their commercial acumen, ignoring all other aspects of Armenian economic and social life. The reality of course is that the majority of Armenians continued to reside in villages and like their regional neighbours practiced handicraft production that expressed their cultural heritage; Armenians, however, were the only ones known to have excelled at carpet weaving. A final point is that over the centuries many Armenians for various reasons converted to Islam, albeit without abandoning their cultural identity. In this way it is possible to grasp how many Armenian aesthetic values became part of the regional design repertoire.

Only following the Russian annexation of the Caucasus did foreign interest in the region revive, while the rapid increase in Caucasian carpet exports in the last quarter of the 19th century led to growing Western interest in the carpets themselves and by extension those who wove them. Much of the resulting information was supplied by dealers whose interest in promoting an understanding of the "uniqueness" of regional production was dictated more by commercial than ethnographic considerations, a phenomenon described as "dealer lore" and analysed in detail by Brian Spooner [9]. Caucasian carpets, with their bold geometric designs and bright colouration, employing traditional dyes and dyeing methods, added to their allure, notwithstanding that production was increasingly influenced by marketing considerations mediated through *kustar* (cottage industry worker) committees dominated and financed by the Imperial Russian government; official support for the 110 peasant workshops and schools totalled 1.53 million roubles in 1912 [60, p. 53].

The connections between historic and contemporary carpet production are, accordingly, tenuous at best. Little is known of the pre-Russian carpet industry, the earliest extant example of Caucasian production, the so-called Dragon Carpets, dates to the 16th – 17th century. While

many carpets of this design are known few are dated and typically lack in-woven signatures or inscriptions. Originally ascribed confidently to Armenian weavers, later authors concluded they could only be of Turkish or Persian origin, but even then opinion was divided, as today, as to which was the design's original home. The well documented association of Armenians with carpet production was discounted – owing either to the lack of "genuine" early examples of their work (*pace* Pope) [3] or, more recently, because they could only have been made in a well-capitalised court workshop, which at the time did not exist anywhere in the Caucasus (*pace* Bier) [2, p. 173] – notwithstanding that nothing in either country's textile oeuvre correlates with these rugs. It has long been conceded that Armenians could have woven these carpets but for various unconvincing reasons could not have been the original source of the design. Most of these arguments depend upon little more than spurious logic, tendentious ethnic claims or comparisons with Russian-era designs, none of which, either individually or collectively, constitute a valid intellectual standard. In more recent years the debate, regrettably, has been inflamed by regional ethnic and political animosities that can only further cloud the debate and challenge the impartiality of those engaged in it.

References

1 Kerimov, L., *Azerbaijan Carpets*, Baky Jazychy, Baku (1985).

2 Bier C., 'Carpets for commerce: rug weaving in the Caucasus', in *Textiles in Trade: Proceedings of the Textile Society of America Biennial Symposium*, Textile Society of America, Washington (1990) 166-173.

3 Pope A. U., 'The myth of the Armenian dragon carpets', *Jahrbuch der Asiasiatischen Kunst* **11** (1925) 147-158.

4 Neressian,V., 'The Marcy-Indjoudian Cope', *Ars Orientalis* **40 (**2011) 204-241.

5 McGinnis, J., 'A Neo-Assyrian text describing a royal funeral', *State Archives of Assyria Bulletin* **1**(1) (1987) 1-13.

6 Hubel, R., *The Book of Carpets*, Washington International Associates, Washington (1971).

7 Schurman U., *The Pazyryk, Its Use and Origin*, Armenian Rug Society, New York (1982).

8 Franses, M.; R. Pinner, R., 'The Caucasian collection', *Hali* **3** (1980) 96-115.

9 Spooner, B., 'Weavers and dealers: the authenticity of the oriental carpet', in *The Social Life of Things: Commodities in Cultural Perspective*, ed. A. Appadurai, Cambridge University Press, Cambridge (1986) 195-235, https://doi.org/10.1017/CBO9780511819582.009.

10 Malcolm, J.; Browne E. G., 'Account of a rare manuscript: History of Iṣfahán, presented to the Royal Asiatic Society on May 19, 1827', *The Journal of the Royal Asiatic Society of Great Britain and Ireland* **33**(4) (1901) 411-446.

11 Gans-Ruedin, E., *Iranian Carpets: Art, Craft and History*, Thames and Hudson, London (1978).

12 Bode, W von; Kühnel, E. *Antique Rugs from the Near East*, Bell and Hyman, London (1984).

13 Kendrick, A., *Guide to the Collection of Carpets*, Victoria and Albert Museum, London (1915).

14 Kendrick, A.; Tattersall, C., *Fine Carpets in the Victoria and Albert Museum*, Charles Scribner's Sons, New York (1924).

15 Valentiner, W., *Catalogue of a Loan Exhibition of Early Oriental Rugs*, Metropolitan Museum of Art, New York (1910).

16 Breck, J.; Morris, F., *The James F. Ballard Collection of Oriental Rugs*, Metropolitan Museum of Art, New York (1923).

17 Kendrick, A. F., 'An exhibition of Near Eastern carpets', *The Burlington Magazine for Connoisseurs* **55** (1929), 15-16.

18 Sakisian, A. 'Les tapis a dragons et leur origine arménienne', *Syria* **9**(3) (1928), 236-258.

19 Willborg, P., 'The dragon rugs of Anatolia – a discussion of the type, its origin and age', *Medelhavsmuseet*: *Bulletin,* **18** (1983) 78-85.

20 Franses, M., 'Safavid-style domestic embroideries from historical Azerbaijan, 1550-1800', in *Stars of the Caucasus: Silk Embroideries from Azerbaijan*, ed. M. Franses, M. Carey & S. Krody, Hali Publications Limited, London (2018) 49-105.

21 Eiland, M. L., Jr.: Eiland, M. L., III, *Oriental Carpets: A Complete Guide*, Bullfinch Press, Boston (2001).

22 Der Manuelian, L.; Eiland , M., *Weavers, Merchants and Kings: The Inscribed Rugs of Armenia*, Kimbell Art Museum, Fort Worth (1984).

23 Wright, R.; Wertime, R., *Caucasian Carpets and Covers*, Hali Publications Ltd., London (1995).

24 Mankowski, T., 'Some documents from Polish sources relating to carpet making in the time of Shah Abbas I' in *A Survey of Persian Art from Prehistoric Times to the Present*, eds. A. U. Pope & P. Ackerman, vol. 3, Oxford University Press, New York (1938) 2431-2436.

25 Azadi, S.; Kerimov, L.; Zollinger, W., *Azerbaijani-Caucasian Rugs*: *The Ulmke Collection*, Paul Hartung, Hamburg (2001).

26 Gerber, J., *Description of Countries and Peoples along the Western Shore of the Caspian Sea*, Oriental Literature, Moscow (1963).

27 Preiser-Kappler, J., 'The significance of Tabriz in the spatial frameworks of Italian merchants and ecclesiastics in the 13th and 14th centuries', in *Politics, Patronage and the Transmission of Knowledge in 13th-15th Century Tabriz*, ed. J. Pfeiffer, Brill, Leiden (2014) 251-300.

28 Barbaro, G., *Travels to Tana and Persia*, Hakluyt Society, London (1873).

29 Sergeant, R., 'Material for a history of Islamic textiles up to the Mongol conquest', *Ars Islamica* **10** (1943) 71-104.

30 Het'um, *The Flower of Histories of the East*, Sources of the Armenian Tradition, Long Branch (2004).

31 Tavernier, J-B, *The Six Voyages of Jean Batiste Tavernier through Turkey and into Persia and the East Indies*, London (1678).

32 J. Bell, *Travels from St. Petersburg in Russia to Diverse parts of Asia*, vol. 1, Glasgow (1763).

33 Cartwright, J., 'Observations of Master John Cartwright in his voyage from Aleppo to Hispahan, and backe again', in *Hakluytus Posthumous or Purchas His Pilgrimes*, ed. S. Purchas, vol. 8, University of Glasgow Press, Glasgow (1906).

34 Herzig, E., 'The Armenian merchants of New Julfa, Isfahan', PhD dissertation, St. Anthony's College, Oxford University (1991).

35 Erdmann, K., *Seven Hundred Years of Oriental Carpets*, University of California Press, Berkeley (1970).

36 Dimand, M.; Mailey, J., *Oriental Rugs in the Metropolitan Museum of Art* Metropolitan Museum of Art, New York (1973).

37 Pope, A. U., *A History of Persian Art Since the Seventh Century A.D.*, Peter Davies, London (1930).

38 Ellis, C. G., *Early Caucasian Rugs*, Textile Museum, Washington (1975).

39 Kurdian, H., 'Corrections to 'Myth of Armenian Dragon Carpets'', *Journal of the Royal Asiatic Society of Great Britain and Ireland* **1** (1940) 65-67, https://doi.org/10.1017/S0035869X00079375.

40 Kouymjian, D., 'The Berlin Dragon-Phoenix Carpet and its probable Armenian origin', in *Armenian Rugs and Textiles. An Overview of Examples from Four Centuries. Exhibition Catalogue,* Armenian Rugs Society, Vienna (2014) 16-31.

41 Pope, A. U., 'Les tapis à Dragons. Résponse de M. U. Pope à l'étude de M. Sakisian', *Syria* **10**(2) (1929) 181-182.

42 Sims, E., 'Carpets viii: The Il-Khanid and Timurid Periods' (1990), *Encyclopaedia Iranica*, http://www.iranicaonline.org/articles/carpets-viii (accessed 2018-12-02).

43 Monteith, W., *Notes on Georgia and the New Russian Conquest beyond the Caucasus*, Foreign and Commonwealth Office Collection, London (1829).

44 Lynch, H. *Armenia: Travels and Studies*, vol. 1, Longmans, Green and Company, London (1901).

45 G. Bournoutian, *The 1820 Russian Survey of the Khanate of Shirvan*, Gibb Memorial Trust, Cambridge (2016).

46 Bell, H., 'Carpets: Introduction', in *Special Loan Exhibition of Carpets and Other Textiles form Asia Minor*, Pennsylvania Museum and School of Industrial Art, Philadelphia (1919).

47 Tanavoli, P., *Persian Flatweaves*, Antique Collectors Club, London (2002).

48 Azadi, S. 'Carpets xiv: Tribal Carpets' (1990), in *Encyclopaedia Iranica*, http://www.iranicaonline.org/articles/carpets-xiv (accessed 2018-12-02).

49 Denny, W., *The Classical Tradition in Anatolian Carpets*, The Textile Museum, Washington (2002).

50 W. Brice, 'The Turkish colonization of Anatolia', *Bulletin of John Ryland's Library* **38** (1955) 18-44, https://doi.org/10.7227/BJRL.38.1.2.

51 Spooner, B., 'The Iranian deserts', in *Population Growth: Anthropological Implications*, ed. B. Spooner, The MIT Press, Cambridge (1972) 245-268.

52 Jacoby, D., 'Silk economics and cross-cultural artistic interaction: Byzantium, the Muslim World, and the Christian West', *Dumbarton Oaks Papers* **58** (2004) 197-240), https://doi.org/10.2307/3591386.

53 Sharkey, H., *A History of Muslims, Christians and Jews in the Middle East*, Cambridge University Press, Cambridge (2017), https://doi.org/10.1017/9781139028455.

54 Arkun, A., 'Into the modern age, 1800-1913' in *The Armenians: Past and Present in the Making of National Identity*, ed. E. Herzig & M. Kurkchiyan, Routledge Curzon, New York (2005) 40-65.

55 *The Book of Ser Marco Polo, the Venetian*, London (1903).

56 Grasset-Saint Sauver, J. 'Habitan de l'Armenie', in *Encyclopédie des Voyages*, Paris (1796).

57 Hammer, E.; Arbuckle, B., '10,000 years of pastoralism in Anatolia: a review of evidence for variability in pastoral lifeways', *Nomadic Peoples* **20**(2) (2017) 214-267, https://doi.org/10.3197/np.2017.210204.

58 Wallerstein, I., *The Modern World System: Capitalist Agriculture and the Origins of the European World Economy in the Sixteenth Century*, vol. 1, Academic Press, New York (1974).

59 Brüggeman, W., 'The Islamic oriental carpets in Giotto's fresco Christmas Mass at Greccio in Assisi', in *Facts and Artefacts in the Islamic World: Festschrift for Jens Kröger on His 65th Birthday*, eds. A. Hagedorn & A. Shalem, Brill, Leiden (2007) 373-393.

60 Siegelbaum, L. H., 'Exhibiting k*ustar* industry in late imperial Russia / exhibiting late imperial Russia in k*ustar* industry', in *Transforming Peasants: Society, State and Peasantry, 1861-1930*, ed. J. Pallot, Macmillan and Company, London (1998) 37-63, https://doi.org/10.1007/978-1-349-26526-8_3.

Received: 2018-3-22
Revised: 2018-10-15
Accepted: 2018-10-19
Online: 2018-12-3

Estudos sobre têxteis históricos
Studies in historical textiles
A. Serrano, M. J. Ferreira, E. C. de Groot (ed.)

Article / Artigo

Turkey red prints: identification of lead chromate, Prussian blue and logwood on Turkey red calico

Julie H. Wertz[1]
Anita Quye[1,*]
David France[2]

[1] *Centre for Textile Conservation, University of Glasgow, 56 Dumbarton Road, Glasgow G11 6AQ, UK*
[2] *School of Chemistry, University of Glasgow, Joseph Black Building, University Avenue, Glasgow G12 8QQ, UK*
**anita.quye@glasgow.ac.uk*

Abstract
In this research, printed Turkey red calico from the 19th century is analysed using conservation-based techniques to identify the materials used in their manufacture. Turkey red production was a significant industry in Scotland, and the textiles found in archives and collections are a valuable part of Scottish heritage and material history. Turkey red prints were produced via a unique dyeing process followed by discharge printing, and the analysis in this paper using SEM-EDX, FTIR, UHPLC, and microscopy confirms they were made as documented in the literature. Here, we show that lead chromate, Prussian blue, and logwood were used to create the distinctive prints. These results are useful to develop material-specific guidelines for storage and display for improved conservation and collection accessibility.

Keywords
Turkey red calico
Pigments
SEM-EDX
FTIR
UHPLC

Pintados a vermelho-turco: identificação de cromato de chumbo, azul da Prússia e pau de campeche em chitas vermelho-turcas

Resumo
Nesta investigação, algodões pintados a vermelho-turco datados do século XIX são analisados através de técnicas da conservação, com vista à identificação dos materiais usados na sua manufactura. A produção de vermelho-turco foi uma indústria de significativa importância na Escócia e os têxteis encontrados hoje em dia em arquivos e colecções representam uma componente inestimável do património escocês e da história material do país. Os algodões pintados a vermelho-turco eram produzidos através de um exclusivo processo de tingimento seguido de estampagem e a sua análise através de SEM-EDX, FTIR, UHPLC e microscopia confirma que estes foram produzidos de acordo com a literatura. Neste estudo demonstramos que o cromato de chumbo, o azul da Prússia e o pau de campeche eram usados para criar estampas distintas. Estes resultados contribuem para desenvolver directrizes ao nível material para o depósito e exibição da colecção e para a sua óptima conservação e acessibilidade.

Palavras-chave
Chitas vermelho-turcas
Pigmentos
SEM-EDX
FTIR
UHPLC

ISSN 2182-9942

Introduction

One of the major challenges in the display of heritage textiles is their susceptibility to degradation from light exposure and changes in humidity and temperature, especially with organic dyes. To determine the optimal conditions for storage and display, it is necessary to know what a textile is made of, and what colorants are present. Turkey red printed calico (Figure 1) was a significant industry in Scotland for about 150 years from about 1785-1936 [1], and historical pieces are found in many collections in Scotland and around the world [2], in the form of bandana handkerchiefs, quilt piecing, and garments. The term *Turkey red* refers to both the dyeing process and the product, a vivid red shade on cotton fabric or yarn. It was renowned for its brilliant colour and its reputed fastness to light, washing, and rubbing [1]. It was also exceptionally bleach-resistant, and it was said that a true Turkey red could resist discolouration in *eau forte* (dilute nitric acid) for at least fifteen minutes [3] and retained its bright colour after exposure to bleach [4]. This characteristic chemical resistance was later exploited in the process of printmaking.

Turkey red production was established in Western Europe from the Levant in the mid-18th century [5]. The method to make Turkey red requires the cotton fibres to first be imbued with oil, which was difficult to apply selectively. As a result, Turkey red could initially only be produced as a solid red colour. A method for discharge printing using a weakly acidified paste with liquid bleach was developed to create designs on Turkey red, an accomplishment typically attributed to Daniel Koechlin around 1811 [6-8]. According to Persoz, unpublished notes from Koechlin state that the discharge process had already been developed by a Scotsman at the Monteith works, in the Glasgow area [9]. This is consistent with a series of articles and letters published in *The Glasgow Mechanics' Magazine* in 1824; however credit for the invention is claimed separately by John Miller, George Rodger, and David Campbell, all current or former employees of Monteith [10-16]. Regardless of who developed the initial process, it was a significant step forward in the production of Turkey red.

To create discharge prints, the paste was applied using blocks or copper rollers engraved with the desired pattern, and then the fabric was exposed to the *bleaching liquor* of aqueous calcium hypochlorite [$Ca(ClO)_2$]. The weak acid lowered the resistance of Turkey red to the bleach, and white areas would appear where the paste had been applied. This development made it possible to create Turkey red with printed patterns, but the entire fabric still had to be dyed red first. Although in theory any colour could be printed over the discharged white spaces to create multi-colour prints, the overwhelming majority of historical printed Turkey red contains red, yellow, green, blue, white, and black. Pink, effectively light red created with less aluminium mordant, is also seen.

There appears to have been some experimentation documented in certain sample pattern books [8], but most of the literature on dyeing and printing refers only to these colours. The reason for this may be the comparative fastness of Turkey red to other dyes, because the yellow, blue, and green patterns were actually created with *raised*, or developed, pigments rather than dyes [17-19]. Yellow was created by mixing lead nitrate [$Pb(NO_3)_2$] with the acid paste and then, after discharging with bleach, developing the colour via a solution of aqueous potassium chromate (K_2CrO_4) to precipitate lead chromate onto the fibres [20]. Blue areas were made with Prussian blue (ferric ferrocyanide) during the discharge process through a combination of potassium ferrocyanide and iron nitrate, while green was created by layering yellow and blue [19]. Black could be either Prussian blue layered over undischarged red, or logwood printed over the red at the very end [8]. In this case, the choice could have a significant impact on the display potential of the piece due to the difference in fastness between logwood and Prussian blue.

The practice of Turkey red discharge printing is documented in the literature [6, 19], but no analytical investigations have previously been undertaken to confirm the presence of these compounds on historical pieces. This research was part of a doctoral project on the re-creation and characterisation of the Turkey red complex at the University of Glasgow Centre for Textile Conservation and Technical Art History (CTCTAH), to understand more about these unique textiles for improved conservation and display practice. A combination of *in situ* analysis and sampling of fibres was done depending on the technique in question. The fibre samples were examined using polarised light microscopy and a Dino-Lite digital microscope camera. For elemental analysis of lead chromate, scanning electron microscopy with energy dispersive X-ray spectrometry (SEM-EDX) was used, and diffuse Fourier transform infrared spectroscopy (FTIR) allowed for the investigation of organic components of Prussian blue. Organic dyes were identified by ultra-high performance liquid chromatography with a photodiode array detector (UHPLC-PDA).

Figure 1. Printed Turkey red (1887), UGD 13/8/6. University of Glasgow Archive Services, Records of United Turkey Red Co Ltd, GB248.

Methods and samples

Samples of coloured fibres from 19th century printed Turkey red were taken from the unfinished edges of textiles preserved in sample pattern books in the Glasgow University Scottish Business Archive. They were made by the constituent firms of the United Turkey Red Company Limited (UTR), which operated in the west of Scotland from the late 18th to early 20th centuries [1]. The samples analysed in this paper are shown in Table 1 with the sample number, colour, and analytical technique.

The samples were examined using polarised light microscopy. The pigments were analysed by diffuse Fourier transform infrared spectroscopy (FTIR) and scanning electron microscopy with energy dispersive X-ray spectrometry (SEM-EDX), and logwood identified by ultra-high performance liquid chromatography with a photodiode array detector (UHPLC-PDA).

Table 1
Samples of printed Turkey red fibres

Sample	ID	Colour	Technique
1	UGD 13/8/1 #2	Yellow	SEM-EDX
2	UGD 13/8/3 #5	Green	SEM-EDX
3	UGD 13/8/4 #3	Blue	SEM-EDX
4	UGD 13/8/5 #3	Black	UHPLC-PDA
5	UGD 13/8/8 #9	Green	FTIR
6	UGD 13/8/8 #10	Blue	FTIR
7	UGD 13/8/8 #11	Black	FTIR
8	UGD 13/8/7 #6	Pink, black	FTIR
9	UGD 13/8/5 #9	Black	UHPLC-PDA

Polarised light microscopy

The samples were examined using a Zeiss Axiolab Pol polarising microscope and documented with a Zeiss Axiocam 105 colour camera.

SEM-EDX

Analysis of the yellow, green and blue samples was carried out by Dr Peter Chung at the Glasgow University Imaging Spectroscopy and Analysis Centre (ISAAC) at the Glasgow University School of Geographical and Earth Sciences using a Carl Zeiss Sigma Variable Pressure Analytical Scanning Electron Microscope with Oxford Microanalysis software. The samples were situated on a carbon stub and placed in the sample chamber at 45 Pa. Detectors for variable pressure secondary electron (VPSE), angle-selective backscatter (AsB), and energy dispersive X-ray (EDX) were used to investigate sample surfaces, elemental distribution, and composition. The SE and AsB used an acceleration voltage of 20 kV and the EDX used 0-20 kV depending on the required intensity of the signal.

FTIR

Analysis was done using an Agilent 4100 Handheld FTIR spectrometer with a diffuse reflectance sample interface. The sampling area was a circle approximately 0.8 cm^2. Each spectrum is the average of 128 scans taken from 4000-650 cm^{-1} at 4 cm^{-1} resolution in absorbance mode, and a background of the instrument cap was taken every ten minutes. Three spectra were taken for each colour, then averaged and displayed using Spectragryph software.

UHPLC-PDA

Dyes were extracted using a two-step extraction technique suitable for a broad range of dyes [21-22]. The fibre sample was placed in a 1.0 mL flat-bottomed glass vial, 50 µL dimethylsulfoxide (DMSO) added, and the open vial placed in a Talboys dry block heater at 80 °C for 10 minutes. The DMSO was then extracted with a micropipette and retained in a second vial. The fibre was extracted a second time with 75 µL oxalic acid solution made of 0.5 M oxalic acid/acetone/water/methanol (1:30:40:30 v/v/v/v). The vial was returned to the block heater and left for 15 minutes at the same temperature. The oxalic acid extract was then vacuum evaporated to dryness using a BUCHI R-215 Rotavapor at 40 °C and 16 mbar for 30 minutes. The DMSO portion was returned with a micropipette to the fibre vial and the residue reconstituted to combine the extracts. This was filtered through a 0.2 µm PTFE syringe filter to remove particulates and collected in a vial insert.

Sample analysis was performed on a Waters ACQUITY UPLC H-Class system at the CTCTAH. The system is comprised of a sample manager with a flow through needle, a quaternary solvent manager, a column with thermostat ability, and a PDA detector. The system was operated using Waters ACQUITY UPLC Console software and acquisition made with Waters Empower 3 software. Separation was done using a Waters C18 Ethylene Bridged Hybrid (BEH) Shield column (150 mm × 2.1 mm i. d., particle size 1.7 µm) with a Waters C18 BEH Shield VanGuard pre-column (5 mm x 2.1 mm i.d., particle size 1.7 µm). A gradient elution using water, methanol, and formic acid was followed [23].

Results

Lead chromate

The VPSE image of the yellow fibre (sample 1) at 2500× magnification in Figure 2 shows the pigment particles precipitated on the surface. The EDX spectrum

Figure 2. SEM image of yellow fibre (sample 1) showing lead chromate particles on the surface.

in Figure 3 confirms the presence of lead and chromium in the sample, confirming the yellow shade is the result of lead chromate forming during the printing process.

In the Dino-Lite image of the green fibre (sample 2) at around 200× magnification (Figure 4), the colour appears to be a stippled combination of yellow and blue that produces the green perceived by the eye with normal viewing. The AsB images at 500× and 3500× magnification are consistent with this, showing bright patches where the lead chromate is present and less luminous areas corresponding to the Prussian blue pigment. The EDX spectrum in Figure 3 confirmed the presence of lead and chromium, as well as iron. Iron was also present on the blue sample (sample 3), but the response was much less than the lead chromate due to the relatively higher response of EDX to lead, lower concentration, or that this colour has penetrated deeper into the fibre.

Prussian blue

A polarised light microscopy image of the blue sample (sample 3) at 20× nominal magnification in Figure 5 shows the deposits of colour on the cotton fibres. Due to the minimal surface area of single fibres making FTIR analysis without a microscope difficult, the samples used for SEM-EDX could not be tested with FTIR. Samples 5-7 were analysed *in situ* from green, blue, and black areas on printed Turkey red in UGD 13/8/8 (Figure 6) to confirm the presence of Prussian blue.

FTIR spectra of Prussian blue have a peak from the cyano (C≡N) group stretching around 2080 cm^{-1} [24]. This peak was anticipated in the green and blue areas, but black was of special interest because the literature indicates it can be produced two ways, by layering either Prussian blue or logwood over the dyed red ground. Logwood cannot be detected by FTIR because dyes typically are in too small of a quantity to have a signal that shows above that of the bulk fibre. In samples 5-7, the cyano peak was easily distinguished in the spectra as shown in Figure 7a. A second set of spectra were taken from a pink and black textile (Figure 8, sample 8) in Figure 7b did not have a peak around 2080 cm^{-1}, indicating that black was not made with Prussian blue and may therefore contain logwood.

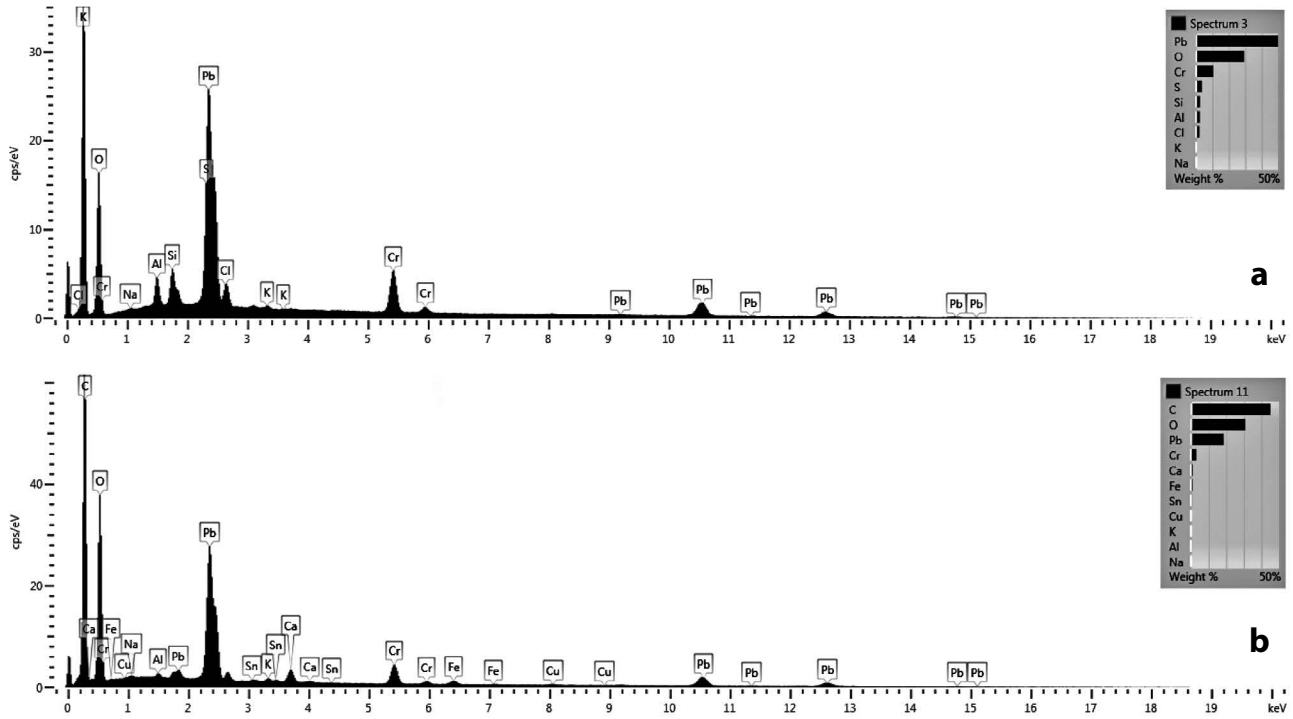


Figure 3. EDX Spectra of *(a)* yellow (sample 1) and *(b)* green (sample 2) fibres.

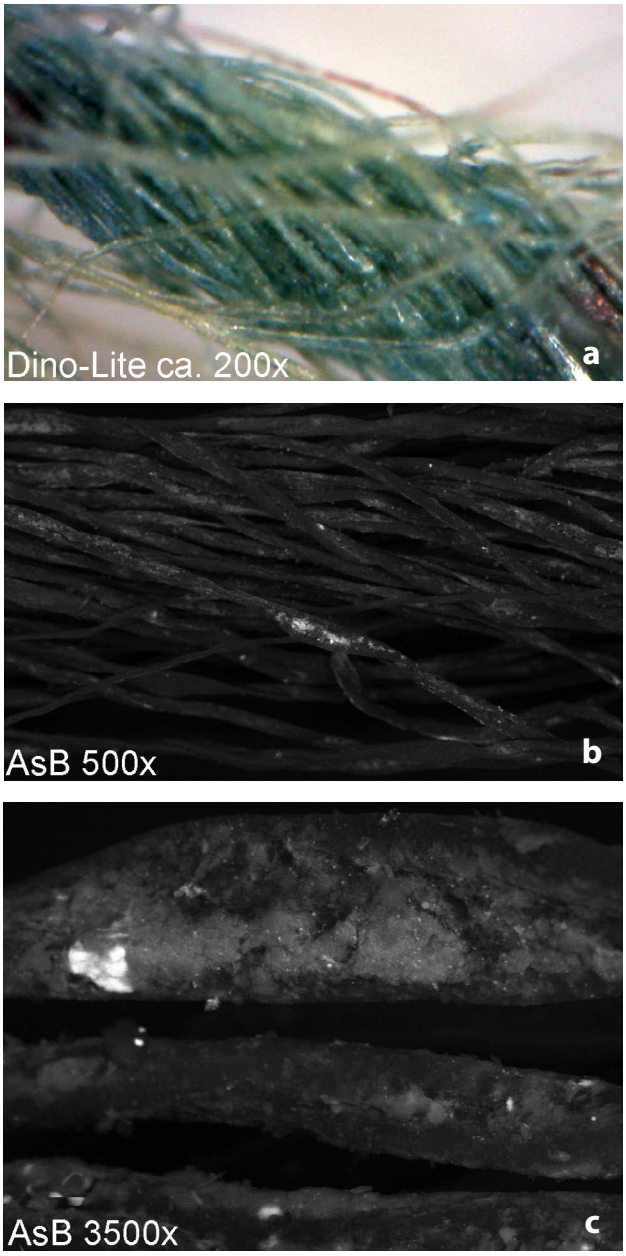


Figure 4. Dino-Lite (a) and SEM images (b, c) of green sample (sample 2) showing the lead chromate and Prussian blue deposits on the fibre.

Logwood

The analysis by UHPLC-PDA of two black fibres confirmed that the colour was printed with the two different methods, although they were taken from the same sample pattern book UGD 13/8/5. After extraction, sample 4 had lost all colour while sample 9 was now blue (Figure 9). Reference standards were not available for the two main components of logwood, haematoxylin and haematein (oxidised haematoxylin) [25]. A sample of cotton dyed with logwood was taken for comparison from *A Manual of Dyeing* (vol. 3, 1893) [26] in the personal collection of Anita Quye for a reference sample. Both the TR sample chromatograms contained the anticipated anthraquinone dyes, such as alizarin. The chromatograms, viewed at 350 nm, had peaks in sample 4 consistent with the logwood reference sample that were absent in sample 9 (Figure 10).

Conclusions

The analysis of the yellow, green, blue, and black Turkey red fibres confirmed the printed textiles were made according to the processes documented in the literature. The SEM-EDX analysis identified lead and chromium on the yellow and green fibres, as well as iron on the green and blue fibres. The FTIR analysis identified Prussian blue on the green and blue areas, and also on a black area. Extraction of the dyes and analysis by UHPLC-PDA confirmed that black could be produced with either Prussian blue or logwood layered over the red ground. The identification of Prussian blue by handheld diffuse FTIR is a useful, non-invasive technique for the analysis of historical Turkey red, especially in the case of the United Turkey Red collection where the textiles are mounted in large, fragile books.

The unusual Turkey red dyeing process made it necessary to use a discharge printing process to create patterns on the textiles. The robustness of Turkey red to fading, especially for light exposure and washing, meant that printed colours would have to be of comparable quality to avoid uneven wear in the finished product. The low water solubility of lead chromate and Prussian blue probably contributed to the wash fastness of the prints. Prussian blue also has a generally good lightfastness, although this has primarily been studied in the context of paintings [27]. A systematic study of cotton dyed with logwood using various metal mordants found that it had generally good wash fastness, but variable and only moderate light fastness [28]. The effect of printing, rather than dyeing, may also have further impact on its robustness since the printing process will impart less dye,

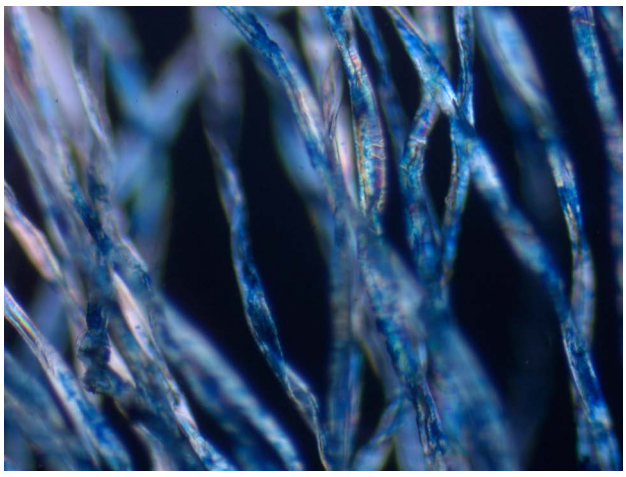


Figure 5. Polarised light microscopy image of blue fibre (sample 3).

Figure 6. Printed Turkey red in UGD 13/8/8 analysed by diffuse FTIR. Spectra were taken of the green petals *(a)*, blue square *(b)*, and black ground *(c)* (samples 5-7). University of Glasgow Archive Services, Records of United Turkey Red Co Ltd, GB248.

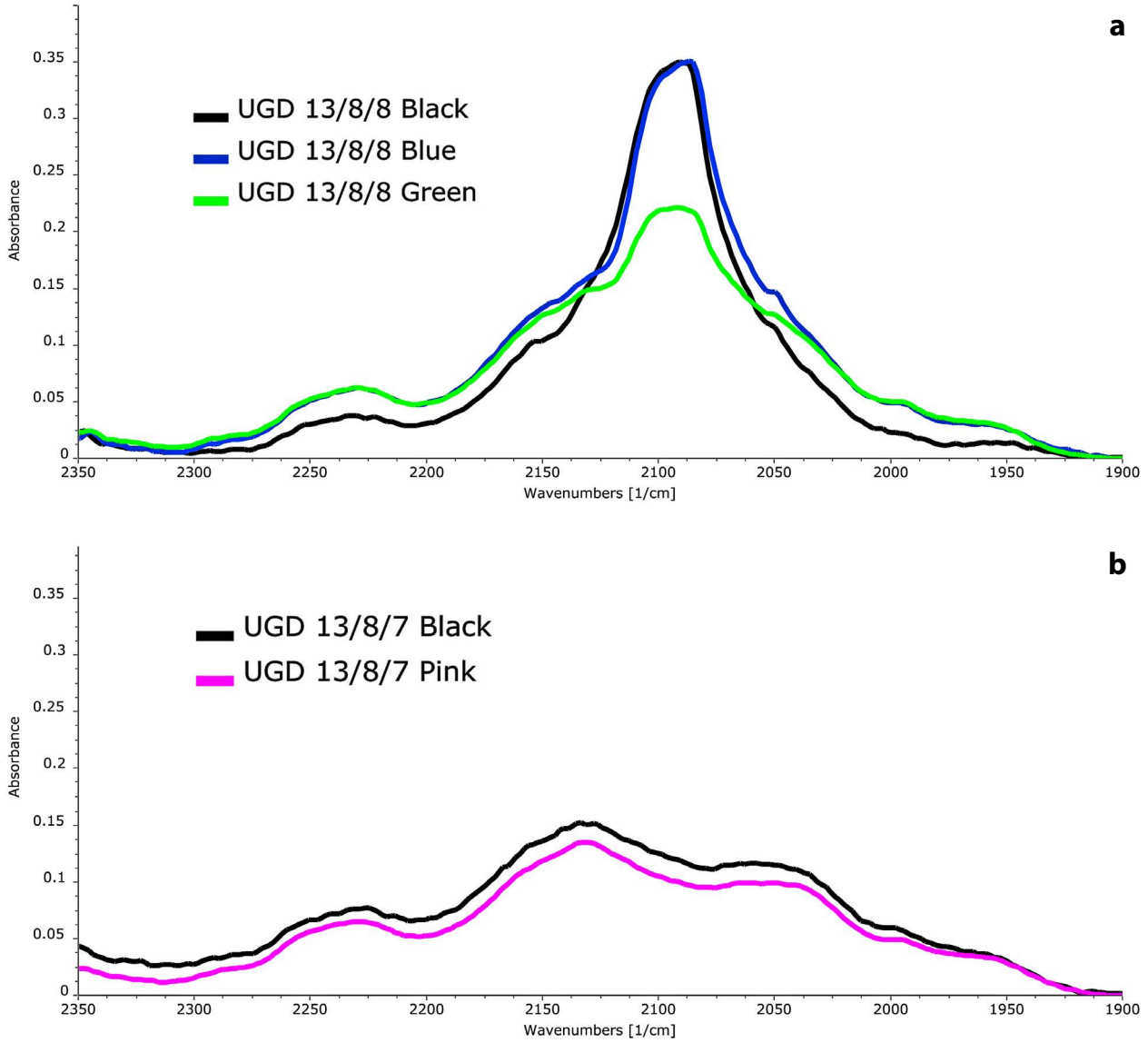


Figure 7. FTIR spectra of printed Turkey red.

Figure 8. Printed Turkey red UGD 13/8/7 (8) analysed by diffuse FTIR. University of Glasgow Archive Services, Records of United Turkey Red Co Ltd, GB248.

and possibly by a different route, than the dyeing process. Lead chromate has been known to darken with exposure to light [29], however previous research was again on paintings rather than textile substrates. Studies of these pigments in a textile context would be useful for care and display of Turkey red collections.

The typical colourway of printed Turkey red is very consistent and indicates most prints were made using lead chromate, Prussian blue, and possibly logwood. Some exceptions can be found, and merit further research on their material composition, but in general this analysis serves as a good set of guidelines for the composition of Turkey red prints. A current project funded by an EU Marie Skłodowska-Curie Action (LightFasTR) [30] is investigating the light fastness of Turkey red, to hopefully develop light exposure guidelines for improved display practice.

Acknowledgements

This research was possible thanks to funding from the University of Glasgow Lord Kelvin Adam Smith PhD scholarship for Julie Wertz. Thanks to Peter Chung at the Glasgow University School of Geographical & Earth Sciences for his assistance with SEM-EDX analysis, Dr Leung Tang of Agilent Technologies for his assistance with FTIR analysis, and Ela Gorska-Wiklo and the Glasgow University Archives and Special Collections staff for collections access and sampling of the Turkey red.

ORCID

Julie H. Wertz
https://orcid.org/0000-0003-1926-2038
Anita Quye
https://orcid.org/0000-0001-6962-6018
David France
https://orcid.org/0000-0002-5409-3316

References

1 Peel, R. A., 'Turkey red dyeing in scotland its heyday and decline', *Journal of the Society of Dyers and Colourists* **68**(12) (1952) 496-505, https://doi.org/10.1111/j.1478-4408.1952.tb02744.x.

2 Nenadic, S.; Tuckett, S., *Colouring the Nation: The Turkey Red Printed Cotton Industry in Scotland c.1840-1940*, NMS Enterprises Limited, Edinburgh (2013).

3 Berthollet, C. L.; Berthollet, A. B., *Elements of the Art of Dyeing*, Stephen Couchman, London (1791).

4 Sansone, A., 'Alizarin-red and Turkey-red dyeing and printing on cotton', *Journal of the Society of Dyers and Colourists* **1**(8)

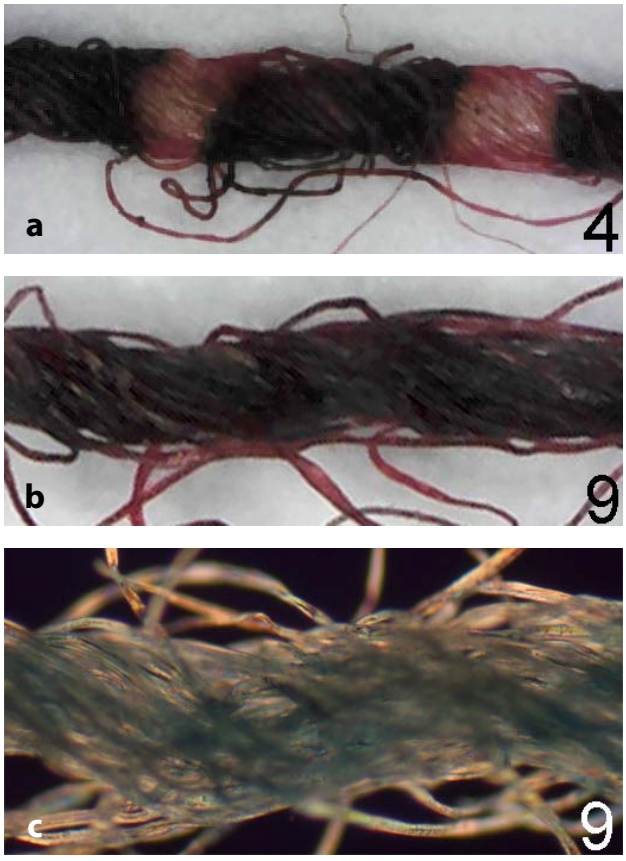


Figure 9. Samples of black fibre analysed by UHPLC-PDA before (a, b) and after (c) extraction.

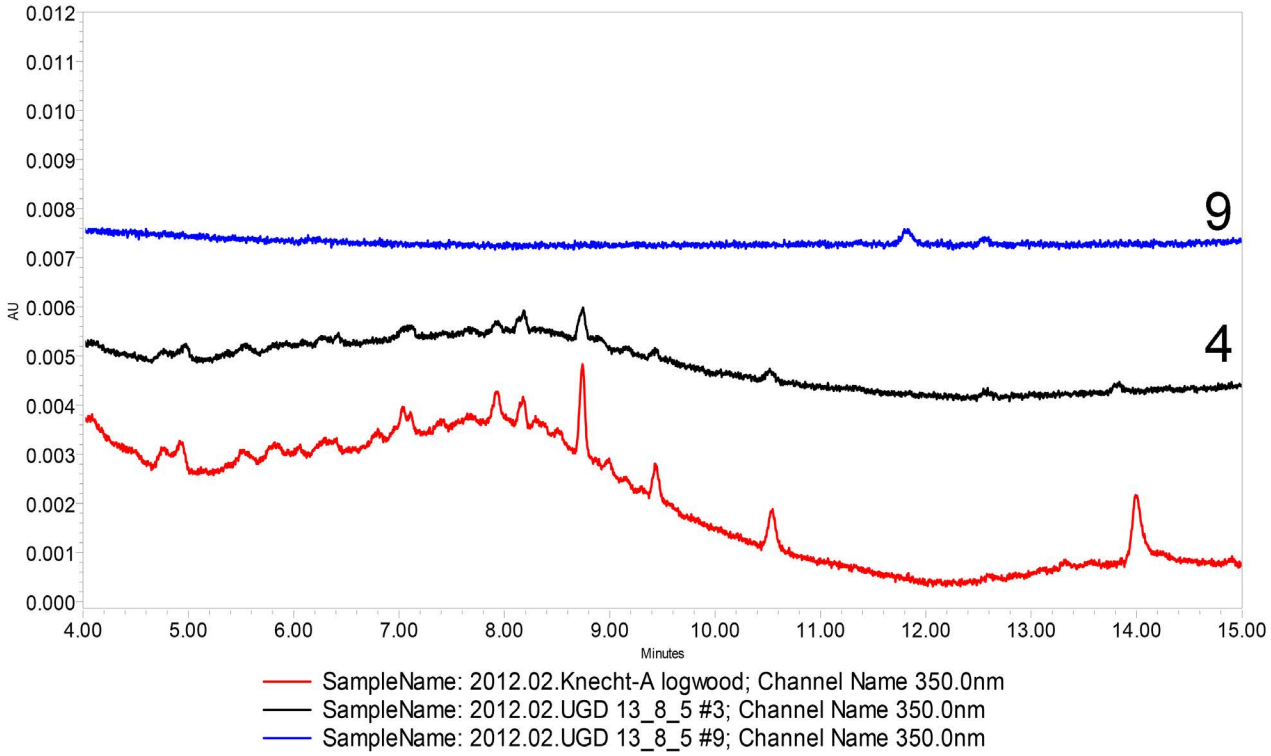


Figure 10. UHPLC chromatograms of Turkey red fibres and a logwood reference at 350 nm.

(1885) 203-211, https://doi.org/10.1111/j.1478-4408.1885.tb00046.x.

5 Cardon, D., *Natural Dyes: Sources, Tradition, Technology, and Science*, Archetype Publications, London (2007).

6 Bremner, D., *The Industries of Scotland, Their Rise, Progress and Present Condition*, Adam and Charles Black, Edinburgh (1869).

7 Jacqué, J. (ed.), *Andrinople: Le Rouge Magnifique*, Éditions de La Martinière, Paris (1995).

8 Storey, J., 'Turkey red prints', *Surface Design Journal* **29**(4) (1996), 7-9, 34-35, 38.

9 Persoz, J.-F., *Traité Théorique et Pratique de l'impression des Tissus*, Victor Masson, Paris (1846).

10 'On the process for discharging Turkey-red', *The Glasgow Mechanics' Magazine* **1**(8) (1824) 117-118.

11 'On the process for discharging Turkey-red', *The Glasgow Mechanics' Magazine* **1** (9) (1824) 138-140.

12 'Notices to correspondents', *The Glasgow Mechanics' Magazine* **1**(10) (1824) 160.

13 'Discharging of Turkey-red', *The Glasgow Mechanics' Magazine* **1**(11) (1824) 176.

14 'Notices to correspondents', *The Glasgow Mechanics' Magazine* **1**(13) (1824) 208.

15 'Notices to correspondents', *The Glasgow Mechanics' Magazine* **1**(14) (1824) 224.

16 Miller, J., 'Statement relative to the discharging process of Turkey red, by means of presses', *The Glasgow Mechanics' Magazine* **1**(29) (1824) 462-464.

17 *The Dyer and Colour Maker's Companion*, William Mackenzie, Glasgow (1849).

18 Crookes, W., *A Practical Handbook of Dyeing and Calico-Printing*, Longmans, Green and Co., London (1874).

19 Duerr, G.; Turnbull, W., *Bleaching and Calico Printing: A Practical Manual*, Charles Griffin & Company, Limited, London (1896).

20 Berthollet, C. L.; Berthollet, A. B., *Elements of the Art of Dyeing and Bleaching*, Thomas Tegg, London (1841).

21 van Bommel, M.; Devièse, T.; Karapanagiotis, I.; Higgitt, C.; Kirby, J.; Mantzouris, D.; Peggie, D.; Proaño Gaibor, A. N.; Russell, J.; Berghe, I. V., 'To extract or not to extract: strategies for the extraction of organic colorants from textile and paint samples', comunication, *Dyes in History and Archaeology 33*, Glasgow (2014).

22 Han, J., 'The historical and chemical investigation of dyes for high status chinese costume and textiles of the ming and qing dynasties', PhD thesis, University of Glasgow, Glasgow (2016).

23 Serrano, A.; Van Bommel, M.; Hallett, J., 'Evaluation between ultrahigh pressure liquid chromatography and high-performance liquid chromatography analytical methods for characterizing natural dyestuffs', *Journal of Chromatography A* **1318** (2013) 102-111, https://doi.org/10.1016/j.chroma.2013.09.062.

24 Ghosh, S. N., 'Infrared spectra of the Prussian blue analogs', *Journal of Inorganic and Nuclear Chemistry* **36**(11) (1974) 2465-2466, https://doi.org/10.1016/0022-1902(74)80454-9.

25 Mantzouris, D.; Karapanagiotis, I.; Valianou, L.; Panayiotou, C., 'HPLC-DAD-MS analysis of dyes identified in textiles from Mount Athos', *Analytical and Bioanalytical Chemistry* **399**(9) (2011) 3065-3079, https://doi.org/10.1007/s00216-011-4665-4.

26 Knecht, E.; Rawson, C.; Loewenthal, R., *A Manual of Dyeing*, Charles Griffin & Company, Limited, London (1893).

27 Kirby, J.; Saunders, D., 'Fading and colour change of Prussian blue: methods of manufacture and the influence of extenders', *National Gallery Technical Bulletin* **25** (2004) 73-99.

28 Zarkogianni, M.; Mikropoulou, E.; Varella, E.; Tsatsaroni, E., 'Colour and fastness of natural dyes: revival of traditional dyeing techniques', *Coloration Technology* **127**(1) (2011) 18-27, https://doi.org/10.1111/j.1478-4408.2010.00273.x.

29 Easthaugh, N.; Walsh, V.; Chaplin, T.; Siddall, R., *The Pigment Compendium*, Elsevier Science (2004).

30 'LightFasTR: Understanding the light-fastness of heritage Turkey Red textiles through modern dye chemistry and historical dyeing technology to inform sustainable display and access' (2017), in *CORDIS*, European Commission, https://cordis.europa.eu/project/rcn/207842_en.html (accessed 2019-1-26).

Received: 2018-6-12
Revised: 2018-10-28
Accepted: 2018-10-31
Online: 2019-2-3

Estudos sobre têxteis históricos
Studies in historical textiles
A. Serrano, M. J. Ferreira, E. C. de Groot (ed.)

Article / Artigo

A challenging treatment of an 18th century embroidered textile using gel cleaning in combination with decamethylcyclopentasiloxane (D5) silicone solvent barriers

Anja Smets[1,*]
Kristel De Vis[2]
Natalie Ortega-Saez[2]

[1] *Freelance textile conservator, Antwerp, Belgium*
[2] *University of Antwerp, Faculty of Design Sciences, Conservation Studies, Blindestraat 9, 2000 Antwerp, Belgium*
**anjasmets@live.be*

Abstract
Bleeding dyes are a major concern to textile conservators; they can cause extensive damage to textile objects and usually preclude a wet cleaning treatment. Since gel cleaning methods were introduced to the conservation field, new opportunities are available for such complex treatments. This paper describes the cleaning of an embroidered textile that is damaged by dye bleeding of the embroidery threads on an undyed silk ground. It was examined whether further bleeding of the dyes during wet cleaning can be avoided by the use of an agarose gel to deliver an aqueous solution, prepared with pH buffers and chelators, to the silk ground. Additionally, the siloxanes octamethylcyclotetrasiloxane (D4) and decamethylcyclopentasiloxane (D5) were tested for their potential to act as barrier liquids for the embroidered areas. The cleaning method was successful in preventing further bleeding of the dyes, but the coloured stains could not be removed completely by the compound cleaning solution. Further research is required to optimize the cleaning method.

Keywords
Textile conservation
Bleeding dyes
Gel cleaning
Agarose
D4 and D5 silicone solvents

O difícil tratamento de um bordado do século XVIII com gel de limpeza em combinação com barreira de líquido de silicone decametilciclopentasiloxano (D5)

Resumo
A migração de corantes é um problema para os conservadores de têxteis, pois pode causar danos significativos nos objectos e impedir o seu tratamento por via húmida. Com a introdução dos geles de limpeza em conservação, surgiram novas oportunidades para esses tratamentos difíceis. Este artigo descreve a limpeza de uma peça de seda danificada devido à migração de corantes dos fios do bordado para o fundo branco. Investigámos se, através do uso de gel de agarose com uma solução aquosa preparada com soluções-tampão de pH e quelantes, pode ser evitada a continuação da migração dos corantes durante o tratamento por via húmida. As soluções de siloxanos octametilciclotetrasiloxano (D4) e decametilciclopentasiloxano (D5) foram também testadas devido à possibilidade do seu uso, como barreiras de líquido, para protecção do bordado. O método de limpeza desenvolvido foi eficaz na prevenção da continuação da migração dos corantes, mas as manchas iniciais não puderam ser removidas completamente. É necessária investigação adicional com vista à optimização deste método.

Palavras-chave
Conservação de têxteis
Migração de corantes
Gel de limpeza
Agarose
Solventes de silicone D4 e D5

ISSN 2182-9942

Conservar Património **31** (2019) 41-52 | https://doi.org/10.14568/cp2018023
ARP - Associação Profissional de Conservadores-Restauradores de Portugal
http://revista.arp.org.pt

Introduction

In 2016, the textile collection of Hotel-Museum Merghelynck in Ypres (Belgium) was transferred to the conservation department of the University of Antwerp for conservation treatment. One of the objects in the collection was a textile embroidered with floral motifs. The object was in poor aesthetic condition, presenting a yellowed ground, folds in the object, a wrinkled surface and in particular stains of dye bleed. The damage present indicated that the textile had been stored in a humid environment for a long time or had become wet during a possible calamity (Figure 1).

Stains caused by dye bleeding not only disfigure the textile, but also pose a potential risk of damage and further degradation of the textile fibres. Acidic or alkaline components of coloured organic substances can affect degradation processes. Possible residual products from the dye process containing metal ions (e.g. Fe, Cu, Al) could also be present in the stains, where they could instigate various degradation processes including the photo-oxidation of textile fibres when exposed to visible and ultraviolet light [1]. In order to conserve the textile, cleaning was necessary.

The colourfastness of the embroidery threads in an aqueous environment was first tested. Seventeen samples were taken, of which fifteen were removed from different areas in the silk embroidery and two from the metal-thread embroidery. The results of this test clearly indicated that the dyes of all the threads are water-sensitive.

These results made it challenging to find a suitable and safe cleaning method. Because of the risk of dye bleeding and additional damage to the textile, it was necessary to search for a cleaning method that did not render the embroidery threads wet.

Inspired by the successful cleaning of an embroidered sampler with a similar conservation issue, gel cleaning was examined as a potential treatment method for the embroidered textile. By analogy with the cleaning by Sahmel *et al.*, it was investigated whether a cleaning solution could be composed with chelating agents and pH buffers to remove or reduce the dye bleed on the textile. In addition, agarose gel was tested as a potentially suitable medium for applying the cleaning solution on the silk ground between the embroidery. On the suggestion of Prof. Richard Wolbers, the siloxanes D4 and D5 replaced the cyclododecane used by Sahmel *et al.* to protect the embroidery against further bleeding of the dyes [2].

The object

Original materials and techniques

Identification of the materials and techniques used in the object was performed with polarized light microscopy

Figure 1. Embroidered textile in the collection of Hotel-Museum Merghelynck (Ypres, Belgium), before treatment.

(PLM MOTIC BA310Pol) and stereo microscopy (NEOC T1A 250V).

The embroidery is applied on a fine plain-woven silk ground (52.5 cm height × 101 cm width) with 30 warp threads/cm and 40 weft threads/cm. The silk ground is not dyed and no after-treatment (like starch) could be traced under magnification.

A pattern of flowers and leaves is applied on the ground by silk embroidery and metal-thread embroidery. At the bottom a more abstract border is embroidered in a chequered pattern by couching (lattice couching), framed by metal-thread embroidery.

Fifteen different colours of embroidery thread are used to create the silk embroidery pattern with satin stitches and shadow stitches. Analysis of the dyes was not performed, but it is likely that the embroidery threads are dyed with natural dyes because the textile has been tentatively dated to the eighteenth century. For the metal-thread embroidery two types of metal-thread are used: solid metal strips and metal strips wound around a silk core have been applied by couching to form flower hearts, leaf grains and petioles.

Condition

The silk ground is in a relatively good structural condition. It is slightly yellowed by natural degradation processes; however, the silk has not become brittle. In some areas cracks are present along the edges of embroidered forms and the metal-thread embroidery, probably as a result of the many stitching holes that have weakened the silk fabric.

The main damage is caused by the object having been exposed to moisture. As a result, the dyes of the embroidery threads have run out on the silk ground and the embroidery has lost its initial brightness. Moreover, the object was stored poorly and folded in an inappropriate way. This has caused several folds in the object and some embroidered figures have left a print on the silk ground. Moisture has also caused corrosion and degradation of the metal-threads, with loss of many threads, deposits of copper salts and discolouration of the silk embroidery beneath (Figure 2).

Figure 2. *a)* Condition of the object before treatment, showing stains of dye bleed on the silk ground of the textile, a wrinkled surface and folds in the textile. *b)* Some embroidered figures have left a print of dye bleed on the silk ground.

Testing for treatment – materials and methods

The gel cleaning method with aqueous cleaning solutions consists of two fundamental concepts: on the one hand adding a gelling agent to a cleaning solution to increase the viscosity and thereby gain better control over the cleaning solution during application on a surface, on the other hand optimization of the cleaning capacity of water by the addition of chelating agents, pH buffers, and/or enzymes or surfactants [3].

As a result, different cleaning parameters are involved. In order to define these parameters, the testing procedure was divided in two parts. The first part concerns the physical action of the cleaning process, which aims to deliver a cleaning solution to the silk ground of the embroidered textile while avoiding contact with the water-sensitive dyes of the embroidery threads. Agarose was chosen as gelling agent because the agarose gel can be easily cut to fit in between the embroidered areas. Additionally, the siloxanes D4 and D5 were tested for their capacity to form a barrier between the cleaning solution and the embroidery threads. The second part of the testing procedure concerns the chemical aspect of stain removal, and aims to compose a cleaning solution effective in reducing the stains of the dye bleed. In this study, the additives were limited to a pH buffer and a chelating agent.

The materials are briefly explained in the following subsections, followed by a detailed discussion of the test procedure.

Agarose gel

Agarose is a polysaccharide derived from red seaweed *Gelidium*. Agarose gel is prepared by dispersing agarose in powder form in an aqueous solution and heating to a

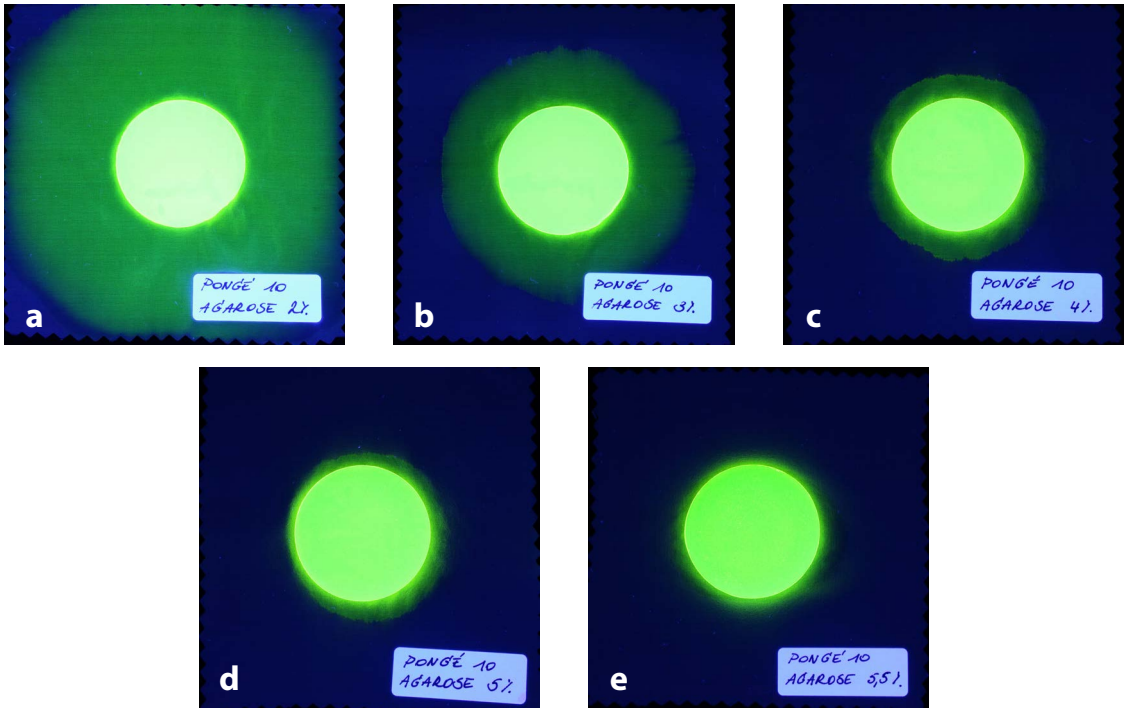


Figure 3. Evaluation of the spreading of a solution into a pongé 10 silk test substrate. agarose gel pads were prepared with the same size and thickness in increasing concentration: *a)* 2 % (m/v) gel; *b)* 3 % (m/v) gel; *c)* 4 % (m/v) gel; *d)* 5 % (m/v) gel; *e)* 5.5 % (m/v) gel. The fluorescent dye uranine (0.02 g/l) was added to the solution to visualise the spread under UV illumination.

temperature above 85 °C. Upon cooling, gel formation takes place at a temperature of 37-39 °C. Agarose forms a gel at low concentrations of mass per volume percentage (m/v). Usually concentrations between 2 % and 5 % (m/v) are used, depending on the method of application and the water sensitivity of the object to be treated [4].

The porous structure of the agarose gel facilitates a slow diffusion of liquids by capillary action. The absorption rate of the gel can be manipulated by changing the concentration of agarose in the solution. At higher concentrations the pores are smaller and the capillary action is stronger; at lower concentrations, the effect is the opposite. [5].

The gel is non-ionic and can be used within a pH range from 4.5 to 10. After preparation the agarose gel is transparent, which allows continuous observation during treatment [2]. An additional advantage to the use of a rigid gel like agarose gel is that it does not require extensive clearing procedures. The gel is in no way attached to the surface and can easily be removed without leaving a visible trace [4-5].

The concentration of the gel (m/v) and the thickness of the gel pad can be directly related to the distribution of the cleaning solution into a textile. Agarose gels prepared at a low gellant concentration show better contact with textile texture and have a positive influence on the diffusion process and capillary action during the cleaning process. However, low-concentration gels have larger pores and consequently a weaker capillary action, allowing the solution to spread quickly through the textile. The spread is also dependent on the weaving structure, the fibre type and the surface tension of the textile fibres [6].

To evaluate how the cleaning solution will move through the silk ground of the embroidered textile, pongé 10 natural silk was selected as a test substrate since it is most alike in structure to the silk ground of the object to be treated. Pongé 10 is plain-woven and has an equal number of warp and weft threads per centimetre. Before testing, the substrate was pre-washed in demineralised water for 30 minutes at 60 °C to remove any post-treatments. Agarose gels (Molecular Biology Grade) were prepared in increasing concentrations (m/v). The gel pads were made with the same size (Ø 4 cm) and thickness (3 mm), so that only the concentration of the gel was a variable. To visualize the distribution of the cleaning solution into the textile, the fluorescent dye uranine was added to the solution (0.02 g/l). Uranine (CAS No. 518-47-8) is a yellow-green fluorescent water-soluble dye and can be used as an indicator in the detection of water flows, such as in leak tests of walls, pipes and tanks; fluorescence can already be observed well at low concentrations with UV light (black light) [7]. The gel pads were photographed after 30 minutes on the substrate in a dark room with ultraviolet illumination (Figure 3).

The tests show that the halo encircling the gel pad decreases, and consequently the spreading of the solution in the textile decreases, as the concentration of agarose in the solution increased. At least a 5 % (m/v) gel is necessary to contain the solution within the circumference of the gel pad, with a slightly better result at a 5.5 % (m/v) gel. The fluorescence visible at these concentrations around the

gel pad is mainly a reflection of the gel pad itself. Testing at higher concentrations did not yield better results.

The rigidity of the gel pad increased considerably as the concentration of agarose was increased, which hindered a good contact of the gel with the substrate. Even on the new and flat pongé silk test fabric, a 5 % (m/v) gel or 5.5 % (m/v) gel showed poor contact with the substrate. The contact could be improved by placing a small weight (for example a glass plate) on the gel pad.

In order to prevent contact of the cleaning solution with the embroidery threads, a 5 % (m/v) gel was chosen to clean the silk ground between the embroidery.

D4/D5 silicone solvents as barriers

Predicting the spread of the cleaning solution when working on the natural aged silk ground of the embroidered textile remained difficult. As any contact of the cleaning solution with the embroidery must be avoided, further testing was carried out with the siloxanes D4 and D5 for their potential to act as barrier liquids.

D4 (octamethylcyclotetrasiloxane) and D5 (decamethylcyclopentasiloxane) are volatile cyclic siloxanes, commercially known as cyclomethicones. A few years ago, these products were introduced in the conservation field when Richard Wolbers started using silicon-based solvents to make micro-emulsions for cleaning acrylic painted surfaces [8]. These organic solvents have been used for the first time in the dry-cleaning industry in response to legal and social pressure to *go-green* (to use environmental and human-friendly solvents). In textile conservation research into the potential of D5 as an alternative solvent for textile conservation cleaning was also carried out [9]. In paper conservation D4 was examined as a masking agent during local aqueous treatment of paper objects [10].

D4 and D5 both are extremely non-polar. The solvents have a low surface tension and therefore spread easily on porous and non-porous surfaces [10]. The high molecular mass of D4 (MW 296.62 g/mol) and D5 (MW 370.77 g/mol) promotes a slow evaporation rate of the solvents [11-12]. Exact evaporation rates when applied on textiles are not

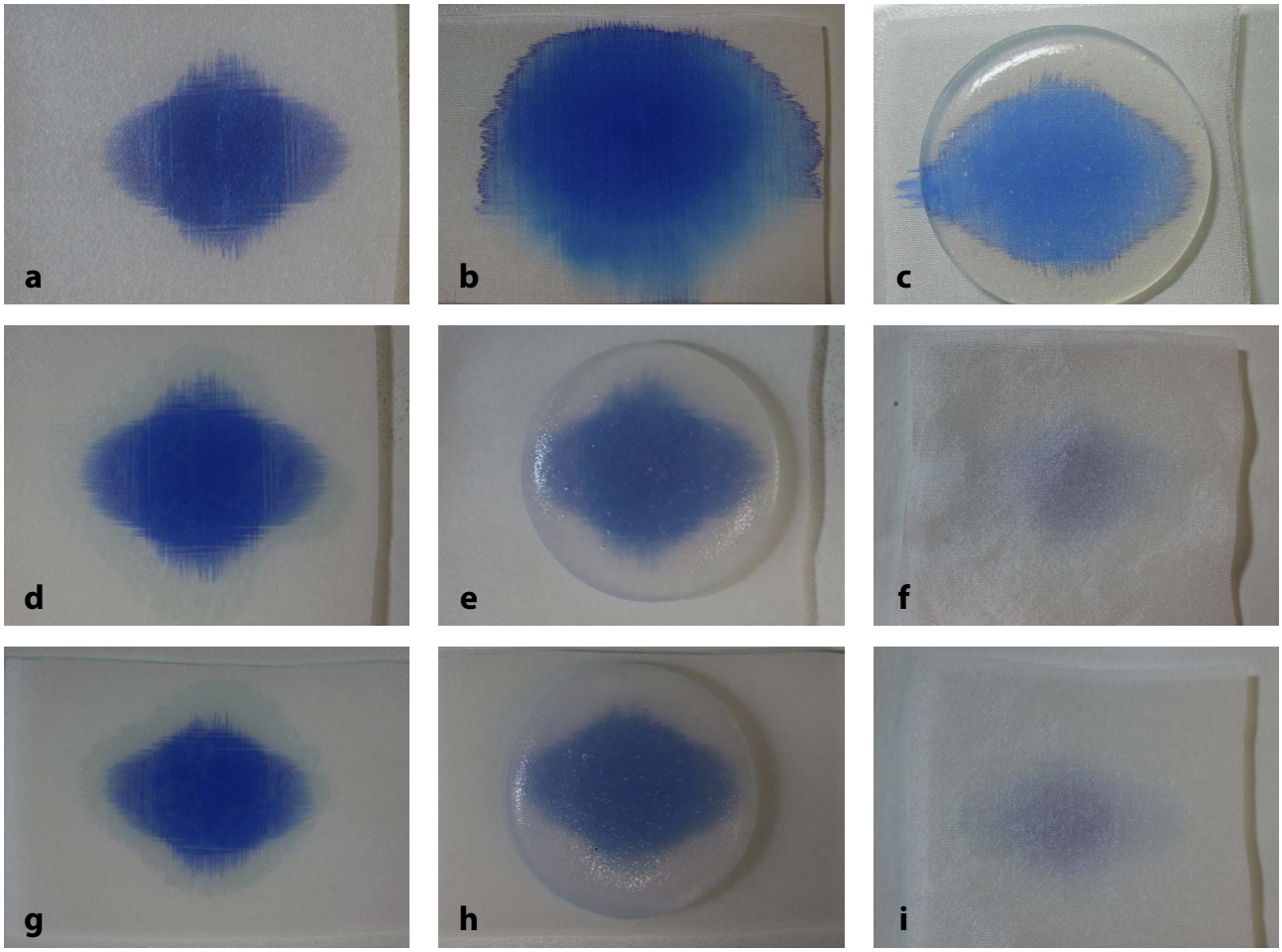
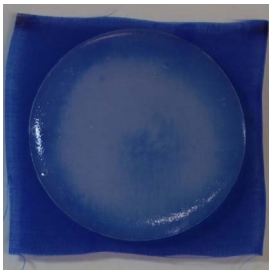
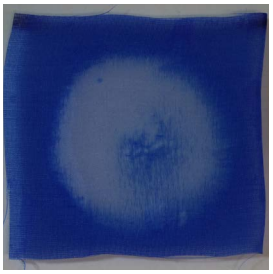
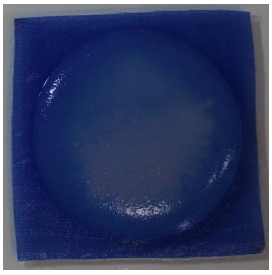
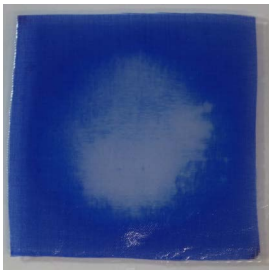
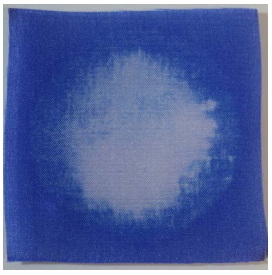


Figure 4. Initial experiments with D4 and D5 to establish their working properties on a pongé 10 silk substrate. *a)* Reference sample with ink stain. *b)* Wetting the ink stain with a drop of water immediately caused spreading of the ink in the substrate. *c)* Application of a 5 % (m/v) gel pad to an ink stain immediately caused movement of ink in the substrate beyond the circumference of the gel pad. No migration of ink could be observed when D4 *(d)* or D5 *(g)* was applied on the ink stain. 30 minute application of a 5 % (m/v) gel pad on an ink stain saturated with D4 *(e)* or D5 *(h)*. After 90 minutes, the 5 % (m/v) agarose gel had absorbed the ink almost completely. *f)* On the substrate saturated with D4 tidelines were slightly visible. *i)* No tidelines were formed when the surface was saturated with D5.

Table 1
Additional tests on a pongé 10 test substrate to ascertain if D4 or D5 have a supporting function in containing a cleaning solution within the circumference of the gel pad

	After 30 minutes	After 60 minutes	After drying
5 % (m/v) gel substrate saturated with D4			
5 % (m/v) gel substrate saturated with D5			

known. D4 has an evaporation rate of about 20 minutes and D5 is completely evaporated after about 2 hours, without leaving visible traces on a textile. The evaporation rate also depends on the ambient temperature and the amount of solvent applied to the surface. The evaporation rate can be controlled by mixing the two solvents [13].

A few experiments on pongé 10 silk with stains of water-soluble blue ink were performed to establish the working properties of the cyclomethicones. Initial tests did not match the expected results. The agarose gel was still able to absorb water-soluble contamination from a surface saturated with D4 or D5 (Figure 4). This observation implies that saturating the embroidery threads with D4 or D5 does not prevent further bleeding of the dyes in the event that the gel accidentally makes contact with the embroidery.

The slower evaporation time of D5 is advantageous as the working-time can be prolonged to 90 minutes. Moreover, no tidelines formed within this time. When D4 was used, tidelines formed, possibly because D4 completely evaporated before the gel could extract the water-soluble substances from the textile.

Initial tests showed that no tidelines were formed when cyclomethicones were used over a working-time shorter than that necessary for their evaporation. There does not seem to be migration of dirt particles outside the gel pad, which occurred when cyclomethicones were not used or when their working-time has exceeded. These findings have led to additional testing to ascertain whether D4 or D5 may have a supporting function in containing a cleaning solution within the circumference of the gel pad.

To visualise the possible supporting function of D4 vs. D5, pieces of pongé 10 silk were completely impregnated with blue water-soluble ink and, after drying, saturated with D4 or D5. A 5 % (m/v) agarose gel was placed on the substrates for 60 minutes (Table 1).

Visually, it was established that the absorption of ink through the gel occurs completely within the circumference of the gel pad. More ink was absorbed in the centre than at the edges of the gel pad. Ink absorption was faster when the surface was saturated with D4.

In order to extend the duration of the cleaning, D5 was selected to saturate the surface of the embroidered textile to be cleaned.

Cleaning with pH buffers and chelators

Aqueous cleaning solutions with buffers and chelators have the potential to dissolve acidic or alkaline substances that are formed during the degradation of organic materials by ionisation and/or dissociation, and solvate insoluble salts by chelation [3].

Buffer solutions always consist of a weak acid (or base) and its conjugate base (or acid). They are characterized by their pK_a value (acid dissociation constant) [14]. The pK_a value of a buffer solution expresses the pH value of the buffer solution. This is also the pH value at which the buffer is most effective in preventing pH changes to the cleaning solution when small amounts of acidic or basic components are solubilised from the surface undergoing treatment. A weak acid or a weak base functions as a buffer within about 1 pH unit of its pK_a value [15] (Figure 5 [16]).

Chelating agents form water-soluble complexes with metal ions and are powerful agents in aqueous solutions used to remove contamination in which metal ions are

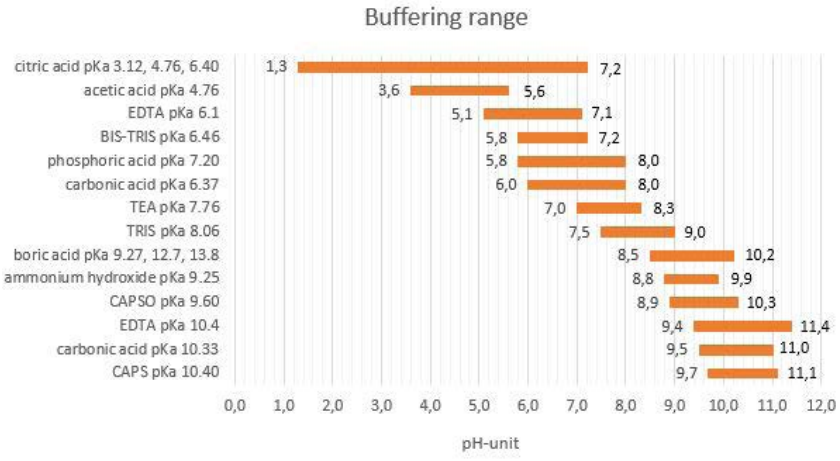


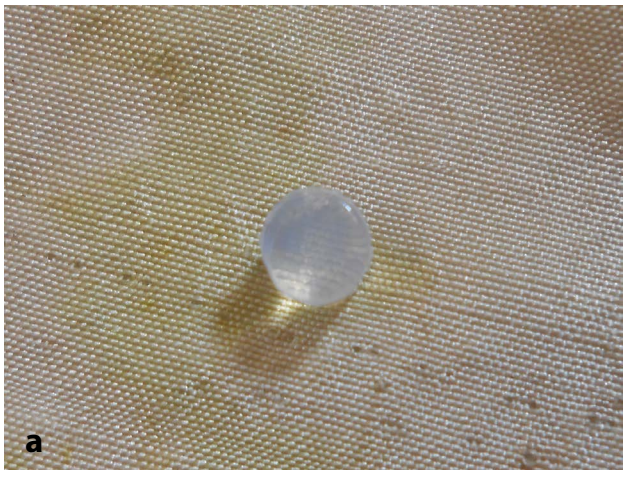
Figure 5. Useful buffering range of various buffers used in conservation [16].

present [1]. Citric acid, EDTA (ethylenediaminetetraacetic acid) and DTPA (diethylenetriaminepentaacetic acid) are frequently used chelating agents in the conservation field, each with its own affinity for different metal ions [15]. They are most effective when they are fully ionized, which depends highly on the pH of the solution. The effect of pH on chelating agents is complex. Since chelators such as citric acid and EDTA also act as buffers, they maintain their initial pH until the limit of their buffering capacity is reached [1].

There are various limitations regarding the use of chelating agents for cleaning historical textiles. If the pH is raised above 12, they form insoluble compounds with metal ions and can precipitate on the object. Mordants of dyes may be chelated, resulting in colour change or bleeding of dyes. Inorganic agents such as tin salts used for the weighting of silk can be extracted from the silk when chelators are used. Textiles coloured, painted or printed with inorganic agents or with pigments containing metal ions (e.g. Fe, Cu, Mn, Sn) cannot be cleaned with chelators because chelation can lead to damage and/or loss of the constituent materials. Finally, the textile fibres can be sensitive to the pH conditions required for effective chelation [1].

Contamination on the silk ground of the embroidered textile consists of a combination of various constituents, such as colouring components of (natural) dyes, residual products of the dyeing process (e.g. metal salts of mordants), corrosion products of the metal threads, and degradation products of the textile and dyes. Consequently, the surface to be cleaned contains a mix of ions (positive and negative). This means that both solutions with a higher and a lower pH than that of the surface of the textile may be able to dissolve detrimental substances by means of ionisation and chelation [13].

To select appropriate aqueous solutions for testing, it is helpful to know the pH of the surface to be cleaned. Subsequently, the desired pH of the cleaning solution can be adjusted with a view to maximize the resolution.



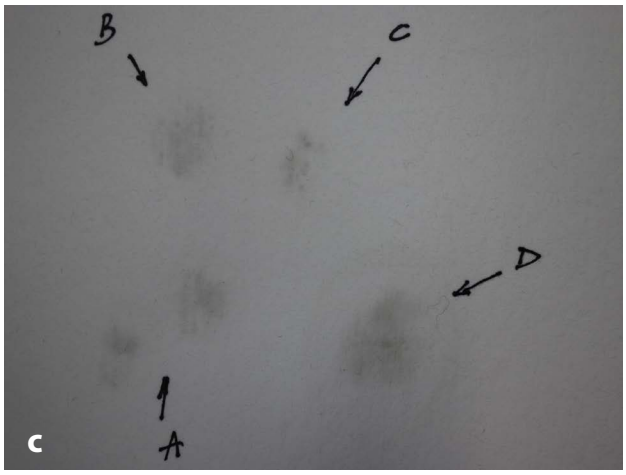


Figure 6. *a)* Surface pH measuring with a 4 % (m/v) agarose gel plug. *b)* Applying the various cleaning solutions on a pink-orange stain on the object with a cotton swab. *c)* Deposits extracted from the textile on the blotter paper underneath the test zone.

Table 2
Recipes of the cleaning solutions prepared with pH buffers and chelators

Recipe	Component			pH solution	pH, after adjusting with 1M NaOH (40 g/l)
	H_2O	Chelator	Buffer		
A	100 ml	0.5 g citric acid	0.5 g boric acid	2.4	8.5
B	100 ml	0.5 g disodium EDTA	0.5 g boric acid	4.5	8.5
C	100 ml	1 g disodium EDTA		4.5	8.0
D	100 ml	0.5 g DTPA	0.1 g acetic acid	2.5	4.5

The surface pH is also a good indicator for the stability of the silk. Proteins are chemically most stable at their isoelectric region where they are neutrally charged. For conservation purposes the isoelectric region for fibroin in silk is considered between pH 3 and 7. Within this pH range, the proteins behave electrically neutral and do not attract positively or negatively charged dirt particles, ionic materials or electron-rich polar groups of organic materials. At these pH values the chance of chemical damage is reduced and the extent of the damage is limited [1]. Therefore, checking the pH before and after cleaning is one way to measure the safety of the cleaning for the silk.

Despite the limitations of this method, *vide* infra, measurement of the surface pH was performed with 4 % (m/v) agarose plugs, prepared with deionized water, and cut out with a biopsy punch (Ø 4 mm). The plugs where placed in four different locations on the silk ground of the embroidered textile for 10 minutes. Afterwards, the pH value of the gel blocks was measured with a Horiba LAQUAtwin Compact pH-meter model B-712 (Figure 6a) [17].

The measured values varied between pH 6.3 and 6.5. Due to the minimal differences at the different locations on the textile, it was assumed that the pH of the entire surface was within the same pH range.

Based on an average pH of 6.4 of the surface to be cleaned, test solutions with 2 pH- units above or below the surface pH were prepared to encourage ionisation, dissociation and chelation of detrimental material (Table 2). In these solutions citric acid, EDTA and DTPA act as chelators for metal ions on the surface. Boric acid in solutions A and B, and acetic acid in solution D, were added as a buffering agents. The solutions were pH-adjusted with 1 M NaOH to the desired pH. Solution C was not buffered; in this solution EDTA had a strong chelating effect.

A small amount of each cleaning solution was applied with a cotton swab to a pink-orange stain on the silk ground of the embroidered textile. Blotter paper was placed underneath the textile to absorb the cleaning solution and the dirt particles (Figure 6b).

Visually was established that the cleaning solutions had extracted dirt from the textile. Dark coloured deposits were visible on the blotter paper, but no pink or orange dyes were detected. Colour changes of the stain itself were minimal and showed no visual difference between the different cleaning solutions (Figure 6c).

Examining the pH of the surface after cleaning showed that no pH change had occurred. The pH of the surface after application of the different cleaning solutions varied between pH 6.2 and 6.4. It was therefore assumed that the surface pH of the silk fell within its isoelectric range and that the different cleaning solutions could be regarded as safe for the textile.

Since no differences could be observed visually with regard to the effectiveness of the cleaning solutions, and because none of the cleaning solutions caused measurable pH changes to the silk ground, the solution with citric acid as chelator and boric acid as pH buffer was selected for the cleaning.

Treatment in practice

The cleaning process was initiated with the preparation of the gel. The cleaning solution was prepared by adding 0.5 g of citric acid and 0.5 g of boric acid to 100 ml of demineralised water. The pH of this solution was circa 2.4. Sodium hydroxide (1 M NaOH) was added dropwise to raise the pH of the solution to 8.5. To 100 ml of this buffered solution, 5 g of agarose powder was added.

The mixture was heated to 90 °C in a microwave oven. After approximately 1 minute, the solution was stirred and then further heated for 30 seconds. Before pouring, the mixture was stirred again to prevent the formation of air bubbles in the gel pad. The warm mass was poured onto a glass plate (15 cm × 30 cm) with raised edges of 2 mm and levelled with a large spatula. The gelling process during cooling was fast; therefore smoothing the gel should be executed quickly to achieve an even gel pad of 2 mm thickness.

An area on the object was impregnated with D5, applied economically via pipette to the ground fabric and to the edges of the embroidered regions. The solvent spread easily over the surface and quickly penetrated the textile fibres. After saturation with D5, the surface had a greasy appearance (Figure 7).

Figure 7. Saturating the silk ground of the object with D5. After application of D5, the surface looked greasy.

Figure 8. Cutting the agarose gel into shape to fit in between the embroidered areas.

Figure 9. The agarose gel pads were placed on the silk ground for one hour and covered with glass plates to promote good contact and to delay dehydration of the gel.

The glass plate with the gel was placed on the area to be cleaned. Because the gel was transparent, the required gel shapes were clearly visible and could easily be cut with a scalpel (Figure 8). The pre-cut gel pads were transferred to the ground fabric and covered with glass plates to encourage the contact of the gels with the textile. At the same time, the covering prevented dehydration of the gel pads (Figure 9). The gel pads were left on the textile for approximately 60 minutes, and subsequently removed from the textile and dried [18].

Results

Visual inspection of the gel pads after removing them from the surface was carried out. A pale yellow to brown discolouration could be observed on most gel pads. Some areas on a few gels were not discoloured, probably in places where contact of the gel with the textile was insufficient. Other discolouration (red, blue, green, etc.) was not observed. Additionally, it was confirmed that bleeding of the dyes of the embroidery threads could be prevented by the application of the cleaning solution in the agarose gel combined with the saturation of the surface with D5.

The discolouration of the silk ground was noticeably diminished after the treatment and the silk regained more shine. No tidelines could be observed after cleaning. The folds and pleats that were present in the textile before cleaning were also flattened.

Most of the stains of dye bleed on the silk ground were reduced. However, they could not completely be removed by this treatment. This may indicate that the cleaning agents dissolved at least partially the components of the dye bleed. Nevertheless, the stains cause less visual disturbance and the aesthetic appearance of the embroidered textile was improved considerably (Figure 10).

Conclusion

The treatment of the embroidered textile of Hotel-Museum Merghelynck was partly successful. The use of an agarose gel, in combination with the saturation of the silk ground of the object with D5 prevented further

bleeding of the dyes during the cleaning. However, the 5 % (m/v) agarose gel was too rigid to achieve an overall even contact with the ground of the embroidered textile, which hindered a homogeneous cleaning process.

Gel pads prepared with lower concentrations of agarose were more flexible and could make better contact with the surface of the textile. However, their larger pores result in a decreased ability to retain the cleaning solution, and cause an over-saturation of the textile. In turn, this caused tidelines. Further research is needed to evaluate whether agarose gels prepared at lower concentrations can be used with a D5 barrier, without contacting the water-sensitive dyes of the embroidery. In addition, the more flexible PVA hydrogels should be examined for their use on textiles [19- 20].

None of the selected cleaning solutions containing buffers and chelating agents were able to remove the dye bleed on the silk ground completely. Nevertheless, they could reduce the dye bleed and remove other degradation products from the textile.

The composition of the cleaning solutions was based on the surface pH of the silk ground to encourage ionization and chelation of detrimental products on the textile. Surface pH measuring was performed with agarose gel plugs. It should be noted that accuracy of surface pH measuring by agarose gel plugs has been questioned by more recent research [21]. Consequently, a possible erroneous measurement of the surface pH may have influenced the effectiveness of the cleaning solutions.

It is likely that characterisation of the dyes may inform the use of different cleaning solutions and eventually lead to better cleaning results. However, due to restrictions in time and budget in the present study, there was no opportunity to analyse each of the many dye colourants present in the textile.

The gel cleaning method described in this study can be considered as an option to clean textiles with bleeding dyes. Further research is necessary to optimize the cleaning method. The lack of tidelines achieved by using D5 during local cleaning, can be regarded as an important advantage and may be of great interest to many textile conservators.

Materials and suppliers

- Acetic acid, VWR Belgium, https://be.vwr.com/store/
- Agarose LE MDBio, Inc, Gel Strenght (1 %) ≥ 1200 g/cm², EEO 0.1-0.15, Gelling point (1.5 %) 33±1.5 °C, melting point (1.5 %) 87±1.5 °C, Gentaur Europe BVBA, https://www.gentaurshop.com/
- Boric acid, citric acid, D4 (octamethylcyclotetrasiloxane) (CAS no. 556-67-2), D5 (decamethylcyclopentasiloxane) (CAS no. 541-02-6), uranine (CAS no. 518-47-8), Kremer Pigmente GmbH & Co. KG, Germany, https://www.kremer-pigmente.com
- DTPA, disodium EDTA, Sigma-Aldrich, Belgium, https://www.sigmaaldrich.com
- Pongé 10, 90 cm, 40 g/m natural white, Schmidt & Bleicher GmbH & Co. KG, Germany, https://www.ideen.com

References

1 Tímár-Balázsy, Á.; Eastop, D., *Chemical Principles of Textile Conservation,* Butterworth-Heineman, Oxford (1998) 158, 221-225, 43.

2 Sahmel, K.; Mina, L.; Sutherland, K.; Shibayama. N., 'Removing dye bleed from a sampler: new methods for an old problem', *American Institute for Conservation of Historic & Artistic Works (AIC), Textile Speciality Group Postprints* **22** (2012) 78-90.

Figure 10. *a)* Left side of the embroidered textile before treatment. *b)* Right side of the embroidered textile after treatment.

3 Cremonesi, P., 'Rigid gels and enzyme cleaning', in *New Insights into the Cleaning of Paintings*, ed. M. F. Mecklenburg, A. E. Charola & R. J. Koestler, Smithsonian Institution Scholarly Press, Washington (2013) 179-183.

4 Warda, J.; Brückle, I.; Bezúr, A.; Kushel, D., 'Analysis of agarose, carbopol and laponite gel poultices in paper conservation', *Journal of the American Institute for Conservation* **46** (2007) 263-279, https://doi.org/10.1179/019713607806112260.

5 Scott, C.L., 'The use of agar as a solvent gel in objects conservation', *AIC Objects Speciality Group Postprints* **19** (2012) 71-83.

6 Schmitt, Emma A., 'An examination of the working properties of agarose gels for textile conservation', MPhil dissertation, University of Glasgow, Glasgow (2014).

7 'Uranine AP (C.I. 45350)', Merck http://www.merckmillipore.com/BE/fr/product/Uranine-AP-%28C.I.-45350%29,MDA_CHEM-108462 (accessed 2017-2-17).

8 Stavroudis, C., 'More from CAPS3: surfactants, silicone-based solvents, and microemulsions', *WAAC Newsletter* **34**(3) (2012) 24-27.

9 Benner, J., 'Investigating the potential of decamethylcyclopentasiloxane (D5) as an alternative solvent for textile conservation cleaning', MPhil dissertation, University of Glasgow, Glasgow (2012).

10 Sullivan, M.; Brogdon-Grantham, S.; Taira, K., 'New approaches to cleaning works of art', Winterthur/University of Delaware Program in Art Conservation (2014), http://resources.conservation-us.org/anagpic-student-papers/anagpic-2014-student-papers-posters/ (accessed 2019-1-21).

11 'Cyclomethicone 4', in PubChem Compound Database, National Center for Biotechnology Information, CID=11169, https://pubchem.ncbi.nlm.nih.gov/compound/11169 (accessed 2019-1-21).

12 'Cyclomethicone 5', in PubChem Compound Database, National Center for Biotechnology Information CID=10913, https://pubchem.ncbi.nlm.nih.gov/compound/10913 (accessed 2019-1-21).

13 Wolbers, R., personal communication (2017-5-2).

14 Haezendonck, Y.; Bruggemans, K., 'Zuur-basereacties', in *Essentiële Elementen Van Chemie – Een Overzicht Van de Fundamenten Van de Scheikunde,* Academic and Scientific Publishers, Brussel (2013) 139-162.

15 Stavroudis, C.; Doherty, T.; Wolbers, R., 'A new approach to cleaning I: using mixtures of concentrated stock solutions and a database to arrive at an optimal aqueous cleaning system', *WAAC Newsletter* **27**(2) (2005) 17-28.

16 Cremonesi, P., 'Materials & methods for surface cleaning and removal of film-forming materials', presentation on a workshop (Maastricht, SRAL, 15-19 February 2016).

17 Stavroudis, C., 'Measuring surface pH and conductivity using water drop and agarose plug methods' (2013), Getty Conservation Institute, https://www.youtube.com/watch?v=bOqZEE7Kb8Y (accessed 2019-1-21).

18 Smets, A., 'Gel cleaning in textile conservation – The use of agarose and D5 for cleaning an embroidered textile with bleeding dyes' (2017), https://www.youtube.com/watch?v=x9A8kw6MssE&t=32s (accessed 2019-1-21).

19 Domingues, J.; Bonelli, N.; Giorgi, R.; Fratini, E.; Baglioni, P., 'Innovative method for the cleaning of water-sensitive artifacts: synthesis and application of highly retentive chemical hydrogels', *International Journal of Conservation Science* **4(**S1) (2013) 715-722.

20 Mastrangelo, R.; Montis, C.;Bonelli, N.; Tempesti, P.; Baglioni, P., 'Surface cleaning of artworks: structure and dynamics of nanostructured fluids confined in polymeric hydrogel networks', *Physical Chemistry Chemical Physics* **19**(35) (2017) 23762-23772, https://doi.org/10.1039/C7CP02662E.

21 Hughes, A., 'Measurement of surface pH of paper using agarose gel plugs: a feasibility study', in *Gels in the conservation of art*, eds. L. V. Angelova, B. Ormsby, J. H. Townsend & R. Wolbers, Archetype Publications, London (2017) 62-66.

Received: 2018-6-17
Revised: 2018-10-31
Accepted: 2018-11-6
Online: 2019-1-25

Estudos sobre têxteis históricos
Studies in historical textiles
A. Serrano, M. J. Ferreira, E. C. de Groot (ed.)

Article / Artigo

The Royal House of Isabel I of Castile (1492-1504): use of silk, wool and linen according to the accounts of Gonzalo de Baeza

Nadia Fernández de Pinedo[1,*]
María Paz Moral[2]

[1] *Departamento de Análisis Económico: Teoría Económica e Historia Económica, Universidad Autónoma de Madrid, España*
[2] *Departamento de Economía Aplicada III (Econometría y Estadística), Universidad del País Vasco, UPV/EHU, España*
**nadia.pinedo@uam.es*

Abstract
Thanks to the conservation of the expense accounting of the Royal House of Isabel I of Castile (1492-1504), it is possible to analyze the consumption of silk, wool and linen fabrics (excluding fabric with metal threads) by class status from the time of the discovery of America to the death of the queen. The most frequently used fabrics by quantity was linen, followed by wool and silk. By cost, however, silk reached 60 % of expenses, followed by wool (31 %) and linen (8 %). As the accounts move down the social ladder, silk disappears altogether, while wool and linen remain. Attending to the colour, black was the most commonly used dye for silk fabrics and red was the most common dye for wool.

Keywords
Consumption
Textiles
Colours
Isabel I
Social status

A Casa Real da Rainha Isabel I de Castela (1492-1504): consumo de seda, lã e linho de acordo com as contas de despesa de Gonzalo de Baeza

Resumo
Graças à preservação das contas de despesa da Casa Real da Rainha Isabel I de Castela (1492-1504), é possível analisar o consumo de tecidos em seda, lã e linho (com excepção de tecidos com fios metálicos) por estatuto social desde o ano do descobrimento da América até à morte da rainha. O tecido mais usado em quantidade era o linho, seguido da lã e da seda. Em termos de valor monetário, contudo, a seda alcançava 60 % das despesas, seguida da lã (31 %) e do linho (8 %). Assim que as contas descem na escala social, a seda desaparece completamente, enquanto que a lã e o linho se mantêm. Em relação à cor, o negro era o corante mais usado em tecidos de seda, e o vermelho, o mais comum em lãs.

Palavras-chave
Consumo
Têxteis
Corantes
Isabel I
Estatuto social

ISSN 2182-9942

Conservar Património **31** (2019) 53-66 | https://doi.org/10.14568/cp2018021
ARP - Associação Profissional de Conservadores-Restauradores de Portugal
http://revista.arp.org.pt

Introduction

A large number of historians have studied the reign of the Catholic Kings, especially the power relations in the court, and the fiscal, political and cultural aspects of their reign [1-11]. The abundance of existing documentation by official royal chroniclers has been vital for expanding this knowledge [12]. The purpose of this article, however, is to focus not on the reign but on the court's purchases and consumption. We examine the shopping basket and the weight that fabric spending had and analyse fabric consumption at the turn of the fifteenth century. As Braudel pointed out, beyond the economic implications of the manufacture of fabrics, "l'histoire des costumes est moins anecdotique qu'il n'apparaît. Elle pose tous les problèmes, ceux des matières premières, des procédés de fabrication, des couves de revient, des fixités culturelles, des modes, des hiérarchies sociales" [13, p. 271].

It is important to remember two factors. On the one hand, the Court of the Catholic Kings was itinerant, which had implications from the point of view of consumption [14]. It was necessary to wrap, pack and move the necessary and essential household items as well as those of high value, while other goods were acquired after the court was installed again in another city. This itinerancy implied that only the staff of the court which was indispensable, as well as a part of the "Council with a secret seal or of priority" [15] accompanied the Monarchs. Nevertheless, during the reign of the Catholic Kings, there was actually an increase in the staffing of the Royal House [15] and enactment of court regulations to control and define social behaviour and dress. It is important to note that the House of the Queen of Castile functioned as a platform for social promotion in which Castilian nobility, in order to promote themselves, sought employment for their children as maids, servants or pages [16]. In fact, the House of the Queen was in charge of the *infantes* (the monarch's sons and daughters) as well as the pages and maids that were raised in the court. Hence, the population of the House of the Queen oscillated between 400 and more than 1,000 people [15].

Sumptuary legislation tried to regulate their image. The Catholic Kings promulgated the *Pragmática Sanción* of September 2, 1494 on clothing [17-18], which prohibited both the nobility and the lower classes from wearing costly clothes made with silks or furs, which was reserved for the royalty. This continued the tradition of ordinances and sumptuary legislation from the reign of Alfonso X *El Sabio* (1252-1284), who limited ostentation and regulated the use of certain fabrics, materials (e.g., embroidery of gold or silk threads) and colours by certain social groups [19-21]. The origin of sumptuary laws in all medieval kingdoms can be traced back to Italian cities at the end of the 12th century [22-24]. The regulations controlled both the type of fabrics and colours allowed. For example, Sas van Damme noted that the Castilian Cortes regulated what colours could be worn by Moors and Jews [25, p. 245].

Skilled dyers and commercial networks (exporters and importers of the needed natural colorants) were key elements in the textile industry [26]. The relevance of textiles and empire networks is shown by Ferreira [27] and Cardon, among others, [28-30] who analyse dyes, technical advances and pricing. Dyes were important as they determined to a large extent the price of the dyed fabric and therefore the status of the owner [28]. The nuances and tones of black, blue, red, violet and pink depended largely on the chemical reaction to fix the colour; this was achieved by using the correct compound of dyes, mordants (alum) and additional ingredients, such as rancid olive oil. Skilled dyers and quality dyestuff were essential, which is why dyeing "was often the greatest cost factor in production" and "dyers were the elite of cloth manufacture" [31]. As Finlay noted, "dyed garments were the most visible, widespread, and extensively used signs of social status and conspicuous consumption" [32].

Information from the source: fabrics

In general, the archival sources used to analyse consumption in the medieval and modern eras are trousseaux, post-mortem inventories, material objects and iconography. A wide bibliography exists on the uses and customs of Isabel I, and in particular on her belongings [33-34], that to some extent is based on her will [35] and the accounts of her treasurer. One often used source is *Cuentas de Gonzalo de Baeza, Tesorero de Isabel la Católica* (*Accounts of Gonzalo de Baeza, Treasurer of Isabel la Católica*; hereafter *Accounts of the treasurer*) [36], which is a document that records in great detail the expenditures incurred by the Royal House of Isabel I. It was edited and published in 1955-1956 in two volumes: the first for the years 1477-1491 and the second for 1492-1504, or from the discovery of America until the death of Isabel. Previous studies have analysed his source for specific purposes, such as the information on a year or a specific person (e.g. singers, chaplains or certain members of the nobility), object or fabric. For this article, a systematic analysis of the information in the second volume was carried out and a database created to analyse the *shopping basket* of the Queen's household and the relative weighting of fabric expenses. It is important to note that the *Accounts of the treasurer* has its limitations. For example, it did not include the expenses of the king. Even so, it contains in detail the expenses of Isabel, her children, servants, and donations of fabric to the poor. Another limitation is that, with a few exceptions, the places of origin of fabric are missing. Nevertheless, the *Accounts of the treasurer* is full of information related to textiles, fibres, and colours. The results relating to the years 1483-1491 have been published in Fernández de Pinedo & Moral [37]. Following these authors, we focus only on the fabrics and dyes made from plants and animals. We excluded those textiles whose fibre was made from gold or silver as well as the trousseau of the princesses because they were very costly or specific

expenses that could have caused bias in the sample and the consequent shopping basket.

All the items related to fabric expenses in volume 2 were added to our database, and we included 12 variables organized into two categories. The first category is the purchase itself, and includes the year and place of purchase, description of the product – including type of fabric and colour –, quantity, unit of measure, price, currency used and the cost. To standardise the information, we then took all purchases and converted them using a single measurement of length – the Castilian *vara* (equals approximately 0.8359 meters) – and the price paid and value of the fabric into a monetary unit – the *maravedi* (*mrs*). The second category is the ultimate use of the product; that is, the purpose it would be used for (clothing, white clothes, church, travel, etc.) and the person to whom it was allotted.

With some data excluded (e.g. materials made of gold or silver threads), we obtained 6,287 entries, of which we used 4,668. These correspond to information in *Accounts of the treasurer* that included at least three basic data points: price, amount and the recipient. We ruled out 1,619 entries because the minimum information needed was not available.

See Table 1 for a comparison of the distribution of textile use between 1483-1491 and 1492-1504. On average, the number of *varas* decreased approximately 16.5 % per year. However, the change in the type of fabric was more significant. Although linen remained the most used material (at nearly 50 %), wool (at 30 %) clearly displaced silk from second place. One reason for this change was the reduction in the size of the royal family, mainly due to the marriages of the *infantas* and the departure of the sons of the Duke of Braganza (one of whom is discussed below). However, the personnel assigned to the security of the royal family grew such that "the increase in expenditure coincides with the development of the ceremonialization of the acts of the monarchy" [38, p. 20].

With fewer people of high income and status in the court, the amount of silk and linen used in clothing, bedding and table service (such as tablecloths), decreased. Meanwhile, both the relative and absolute weight of woollen fabrics increased. This may be because woollens were part of Isabel's donations of fabrics and clothing to the court's servants. Most likely, these donations followed the sumptuary laws and social hierarchy as in northern Italy in the 14th century, as noted in Buss [22, p. 37].

In analysing the *value* of the textiles from 1483 to 1491, we found the amount slightly modified but the ranking did not change: silk represented almost two-thirds, wool nearly one-third and linens the rest. It is worth mentioning the increase in the use of wool over linen and silk. Linen was used undyed and had a great variety of uses, from wrapping household items, to tablecloths, and to shirts. Silk, although it could also be used for bed sheets and undergarments, was mostly used for outer clothing, as was wool. This could explain why the amount spent on wool increased mostly in relation to silk but not linen. It should also be noted that other fibres, such as cotton or hemp, had a negligible weight from 1483 to 1504.

Data from 1492 to 1504 mostly does not differ from the previous period in terms of usage: in terms of *varas*, linen is the highest; in terms of value, it is silk. Tables 2-4 allow a closer look at the fabrics. We found a great variety of names associated with the fabrics. The names do not imply the technical description but rather the type of fibre, colour, and even decoration, similar to Cabrera [39, p. 10]. We provide the original names of the fabrics; we translated the names using specialized dictionaries [23-24, 40-46].

Table 1
Consumption of fabrics by the Queen's house, annual average 1483-1491 and 1492-1504

Fiber	Quantity				Value			
	1483-1491		1492-1504		1483-1491		1492-1504	
	Varas	%	*Varas*	%	*Maravedis*	%	*Maravedis*	%
Linen	2,474.4	64.64	1,583.5	49.55	184,025.8	11.12	93,886.7	7.94
Silk	847.5	22.14	618.0	19.34	1,244,737.8	75.25	713,965.8	60.37
Wool	482.6	12.61	972.8	30.44	224,360.2	13.56	372,353.3	31.48
Cotton	12.6	0.33	11.7	0.37	461.3	0.03	725.9	0.06
Hemp	5.3	0.14	3.8	0.12	448.4	0.03	87.4	0.01
Other / unknown	5.5	0.14	6.2	0.20	139.8	0.01	1,641.4	0.14
Total	*3,827.9*	*100.00*	*3,196.0*	*100.00*	*1,654,173.3*	*100.00*	*1,182,660.5*	*100.00*

Notes:
Data for 1483-1491 are taken from Fernández de Pinedo & Moral [37].
1 *vara* ≈ 0.8359 meters.

Table 2
Silk: quantity (*varas)* and value (*maravedis*), by type of fabric, annual average 1492-1504

Tejido / Fabric	Quantity		Value		Average price per *vara*
	Varas	%	*Maravedis*	%	
Brocado / Brocade*	27.87	4.51	147,591.25	20.67	5,295.46
Altibajo	9.84	1.59	23,459.52	3.29	2,385.00
Villutado	2.61	0.42	5,463.23	0.77	2,096.71
Carmesí de pelo / Crimson velvet (non sheared)	3.09	0.50	6,423.08	0.90	2,078.84
Aceituní	15.16	2.45	23,886.42	3.35	1,575.59
Otros / Others	9.69	1.57	12,206.15	1.71	1,260.20
Terciopelo / Velvet	304.34	49.25	330,644.20	46.31	1,086.45
Carmesí raso / Dark red satin	0.35	0.06	368.46	0.05	1,064.44
Çebti**	59.84	9.68	45,605.40	6.39	762.17
Raso / Satin	100.63	16.29	70,685.93	9.90	702.40
Damasco / Damask	74.34	12.03	44,463.37	6.23	598.08
Tafetán / Taffeta	10.21	1.65	3,168.81	0.44	310.31
Total	*617.96*	*100.00*	*713,965.82*	*100.00*	*1,155.37*

* *Brocado*: According to Bernis, brocade was a fabric made of silk, gold and silver decorated with motifs on the background in light relief (trees, flowers, artichokes, pineapples, leaves) [18, p. 21].

** Çebty or *'zetani'*. Cebty is a silk fabric, originally from Ceuta (hence the name of cebty) imitated by the Italian silk manufactures, from where it was later imported to the Peninsula. According to Luca Mola, it is a common definition for a silk cloth of the 15th century (especially in Florence, Lucca but also Venice), which tends to disappear afterwards. Originally it indicated a dense and heavy satin. By the 16th century, instead, the word "raso" became usual for satin, and "zetani" is not mentioned anymore.

In the case of silk, we collected no less than 11 types of textiles, with an average price of 1,155 mrs/vara (Table 2). Above that average price, is *brocado* (brocade), which was not affordable by anyone but royalty, and *altibajo* (embroidered velvet), *carmesí de pelo*, *aceituní* and *villutado*.

The number of *varas* of all above-average priced fabrics combined was less than 11 % of the total. Velvet, with a price a little higher than 1,000 mrs/vara, accounts for 50 % of all silk fabrics. Velvet is followed by four fabrics (**ç***ebty*, damask, satin and taffeta), which combined represent almost 40 % of the total of material all under 800 mrs/vara. Considering price, velvet leads the ranking (46 % of total value), followed by brocade (with more than 20 %). The least expensive silk fabrics represent only 23 % of the total value.

Wool fabrics, by comparison, had an average price of 383 mrs/vara (Table 3). Only two fabrics, *grana* or *cochinilla* and *limiste* surpassed the 1,000 mrs/vara, although, on the whole, these last two had little weight.

Most of the wool fabrics (60 % of total *varas*) were below the average price, including *pardillo* (woollen cloth), *buriel* (coarse woollen), and *frisa* (frieze or woollen serge). These cheap woollen fabrics were mainly used by lower-income populations and mendicant friars. As Scott noted, "the clothing of the lower classes drew on a much more limited range of fabrics, dictated by practicality and cost. Even colors, especially crimson, could be forbidden to them and restricted to the upper classes. At the lower social levels, rough, undyed woollens were worn over coarse linens" [47, p. 12].

"Other woollen cloths" includes those with a low percentage share and which usually bore the name of the place of origin. In general, these were above the average price, as in the case of cloths made in Valencia and Rouen. The most expensive woollen cloth was from Florence, costing 1,150 mrs/vara on average. Their high relative weight in this category – 28 % in *varas* and 23 % in value – is because this category includes all entries using the generic term *paño* (cloth).

Linen was the fabric most often purchased, was certainly the cheapest, and the least often used in outer clothing; nevertheless, as stated by Bernis, Spanish Christians wore linen garments through the influence of Andalusian Muslims [18, v1, p. 26]. The variety in quality and prices was based on the material's thickness. A lightweight fabric was used for shirts, sheets and mattresses. Linen garments were often donated to the poor after the original owner died. This is one reason why its presence post-mortem tends to be underestimated and its usage is generally unnoticed. In addition, linen, especially the cheap or very cheap varieties, was a fabric for self-supply (e.g., someone

Table 3
Wool: quantity (*varas)* and value (*maravedis*), by type of fabric, annual average 1492-1504

Tejido / Fabric	Quantity		Value		Average price per *vara*
	Varas	%	*Maravedis*	%	
Limiste	0.62	0.06	738.46	0.20	1,200.00
Grana / Cochineal	102.38	10.52	109,465.28	29.40	1,069.20
Finamarcha	3.31	0.34	2,613.85	0.70	790.23
Contray / Cloth of Courtray	158.46	16.29	88,891.22	23.87	560.95
Londres / London	119.00	12.23	46,787.49	12.57	393.17
Otros / Other woollen cloths	236.94	24.36	78,533.87	21.09	331.45
Palmilla	10.04	1.03	2,446.31	0.66	243.69
Estameña / Tammy*	18.24	1.88	4,109.38	1.10	225.27
Segovia	32.68	3.36	6,243.23	1.68	191.05
Brunete / Coarse woollen	1.88	0.19	353.15	0.09	187.39
Cordellate / Kersey	5.40	0.55	813.46	0.22	150.71
Paño pardillo / Woollen cloth pardillo	121.92	12.53	17,106.05	4.59	140.31
Buriel / Coarse woollen	87.27	8.97	10,062.23	2.70	115.30
Blanqueta / Coarse woollen	0.19	0.02	19.23	0.01	100.00
Luto / Mourning clothes	22.08	2.27	2,111.31	0.57	95.63
Frisa / Frieze	12.52	1.29	660.96	0.18	52.80
Sarga / Woollen Serge	21.46	2.21	1,084.00	0.29	50.51
Sayal / Coarse woollen	18.46	1.90	313.85	0.08	17.00
Total	*972.85*	*100.00*	*372,353.33*	*100.00*	*382.75*

*According to Nemnich and Beck, *estameña* is translated as tammy [45-46].

Table 4
Linen: quantity (*varas)* and value (*maravedis*), by type of fabric, annual average 1492-1504

Tejido / Fabric	Quantity		Value		Average price per *vara*
	Varas	%	*Maravedis*	%	
Cambray / Cambric	1.04	0.0	302.31	0.32	291.11
Manteles / Linen Tablecloths	54.71	3.46	11,627.06	12.38	212.51
Holanda / Holland	300.30	18.96	35,511.14	37.82	118.25
Naval	326.68	20.63	13,884.36	14.79	42.50
Lienzo / Plain linen	216.73	13.69	9,056.93	9.65	41.79
Otros / Others	150.15	9.48	6,177.51	6.58	41.14
Bretaña / Bretagne	474.07	29.94	15,477.49	16.49	32.65
Vitre / Ravensduck	59.81	3.78	1,849.93	1.97	30.93
Total	*1,583.49*	*100.00*	*93,886.73*	*100.00*	*59.29*

who produces and then personally uses the fabric) or distributed amongst specific networks.

On average, 1,583 *varas* of different linens were purchased annually, mainly from Bretagne, and mostly *naval* and Holland linens (70 %). Linen fabric was not expensive, with the average price being 59 mrs/vara. Only the Holland (118 mrs/vara), tablecloths (213 mrs/vara) and *cambray* (291 mrs/vara) were above the average price (Table 4).

We found more than 18,000 *varas* of linen, with their purpose specified, for the period. This represents 88 % of the total linen fabrics (Table 5). Most linens, measured in both *varas* and value, were furnishing and household textiles, such as tablecloths, followed by shirts and bedding (pillows, sheets, kirtles). The heterogeneous *rest* includes garments such as skirts, coifs, etc. As the court was itinerant, essentials such as glassware, place settings and silver objects were wrapped in linen for safe transport. Some objects had to use specific types of linen; for example, linen from Bretagne was used to wrap knifes and chalices; naval to wrap glasses; *vitre* (rough linen) for silver; linen from Flanders for bed chamber clothing; white linen for *angarillas*; white waxed linen for coffers, wooden cabinets and some items from the House of the Queen.

Thanks to *Accounts of the treasurer*, we were able to study not only the most visible fabrics (used for outer clothing) but also less visible fabrics (used for undergarments, tablecloths, and wrapping household items). It emphasizes the weight of linen, at least quantitatively. Each researcher has used the information in the main source for different purposes and to highlight different aspects of life. In our case, although *Accounts of the treasurer* accounts for the importance of linen, it must be remembered that in analysing post-mortem inventories, linen was usually undervalued and even absent. Therefore, we had to be cautious about not generalizing.

Garments and linings

The Middle Ages was a turning point in many ways. Bernis indicates that changes in clothing can be noticed in the 14th century, for example from simple dresses to garments that enhanced the silhouette of both men's and women's body [18, 48]. This change clearly differentiated the dress of men and women, and brought a greater richness and variety of clothing, especially for the most privileged classes. Nobles began to hire personal foreign or national tailors. The professionalization of clothing trades, such as tailors, seamstresses and furriers, was consolidated [49, p. 75]. However, it will not be until last third of the 16th century when the main tailoring treaties appeared in order to standardize clothing models, describe new measurement techniques, offer advice on making garments and economising on fabrics. In any case, the Catholic Kings regulated textile production to encourage the manufacture of higher-quality cloths and face foreign competition, protecting the guilds.

During the 15th century, there were changes in braies (undergarments) for men and shirts for men and smocks for women, hose for both; semi-inner garments (*jubón, cos, faldilla, gonete, basquiña,* hose); outer garments for clothing (*cotte, brial* or *gonela* for women and *jaquetas, ropas* or *sayos* for men); suits (*mongiles, hábitos, sobresaya, marlotas*), and overcoats (*tabardo, capuz, gabán, mantle,cloak, albornoz*) [18, pp. 35-38; 50]. Bernis points out that Spanish fashion had several influences, starting with the French (especially for men's clothing until approximately 1470) and the Italian (at the end of 15th century), and also from the Moors (especially in garments and dresses). These influences combined with national tastes to give rise to original creations. The main changes were to the masculine suit by the shortening of top garments, and the cotte and the tunic being replaced by the tighter fitting doublet, or *jubón*; by shortening the length of women's skirts; and by the diffusion of the *jubón* and the *jaqueta* adjusted to the torso. Women, as happened in Italy, began to wear open sleeves in order to show the shirt. In fact, scotamocks with embroidered sleeves were already in use in 13th century Spain. By exposing the shirt to the elbow, this favoured sleeves or *manguitos* that covered the forearms [51, pp. 110-111]. They continued wearing all kinds of overcoats, especially the *capuces* and *tabardos*, and the cloaks with sleeves or that were open on the sides. The so-called *verdugos*, which helped to create

Table 5
Linen: declared purpose of 18,091 *varas* (1492-1504)

Purpose	Quantity		Value	
	Varas	%	*Maravedis*	%
Bed linens	3,253.6	17.98	219,928.0	20.28
Shirts	3,081.4	17.03	169,455.5	15.62
Table linens	7,732.5	42.74	485,536.5	44.76
Rest	4,023.6	22.24	209,741.0	19.34
Total	*18,091.1*	*100.00*	*1,084,661.0*	*100.00*

Table 6
Garments with linings: distribution by type of lining

	Fabric lining				Fur lining			
	Items	Cheaper	Similar	More expensive	Items	Cheaper	Similar	More expensive
Queen	7 (12%)	5	–	2	4 (15%)	2	–	2
Royal family	41 (72%)	22	2	17	19 (70%)	5	1	13
Noble	1 (2%)	1	–	–	4 (15%)	4	–	–
Others	8 (14%)	7	1	–	–	–	–	–
Total	*57 (100%)*	*35*	*3*	*19*	*27 (100%)*	*11*	*1*	*15*

Notes: *Cheaper:* the lining is at least 10 % cheaper than the fabric; *More expensive*: the lining is at least 10 % more expensive than front. In case of garments made with fabrics, the ratios of prices per *vara* are computed. When the garments are made of fabrics and furs, the total cost of lining and front are compared.

volume via hooped underskirts, became visible in the last third of the 15th century. Women were already used to the habit of covering their heads. The Spanish headdress consisted of braiding the hair into a bun at the back of the head and then wearing a cloth or braided cap. By the end of the 15th century, the preference for shorter, upswept hair standardized the coif or *albanega*, and sometimes on this was added a clear toque. There was also the use of *bonetes* (sort of caps) among women. All these changes comprise Spanish style, and it spread elsewhere.

New fashions were quickly made to emulate the wealthiest, but people of humble origin could hardly afford to follow new trends. Sigüenza stated that the majority of the population wore ordinary, home-made clothing [52, pp. 359-60].

Linings

Bernis and Martínez note that the *outfit* of the time was both inner and outer garments plus attire for the head, feet and hands [48-50]. Some of these garments were lined and complemented with ornaments. Some outer dresses, such as the *hopa,* in fashion from the middle of the 14th century, were lined with fur [52, p. 356] or other rich fabric [36, p. 20].

Although most of the garments described in *Accounts of the treasurer* did not include lining, some dresses had it probably when the fabric was in direct contact with the skin or to protect some fabrics to last longer. The lining might be the same fur or fabric as used for the outer clothing, as highlighted by the source. Isabel purchased white velvet to line a *mongil* made of green velvet, white damask to line a *brocade de cama* (bed brocade), dyed linen to line stoles and *manipulos* made from green and purple *cebty*; and black satin to line *lobas* and habits.

We attempted to relate the prices of linings with the prices of outer fabric, that is, the part seen by others. In doing so, we classified linings into two categories: fur, and other fabric such as wool or silk. Table 6 shows that in 56 % of the cases, lining with fur was more expensive than the fabric used for the outside of the garment. The look of the fur seems secondary in these cases because it was not visible, and was often made from cats, ermines, rabbits or martens.

The same thing occurred with clothes lined with other fabrics: in 40 % of the cases we found, the price of the lining fabrics was more expensive or similar to the fabric for the outside of the garment. In the case of the royal family, this rises to 46 %. In many cases, the lining offered a contrast in colour, and it is very likely that the lining's texture, would be as important as its colour and price. It is true that the only lined garments known to have been worn directly on the skin were hose, but there are no reasons to suggest linings would also be in contact with some parts of the body taking into account the type of fabrics and furs of the inner fabrics.

Table 7 shows the total type of materials used for linings versus outer garments. Looking at the outer fabric of the 57 lined items (rows 1-3), 46 were silk, nine wool, one linen and one other (fustian). In 52.6 % of the cases, silk was used for both linings and outer garments (as was the case for *bonete*, *capuz*, *gabán*, *gonete*, *hábito*, *mantil-*

Table 7
Garments with linings: distribution by type of lining and outer fabric

Lining	Outer fabric				
	Silk	Wool	Linen	Other	Total
Silk	30	3	–	–	33
Wool	14	4	–	–	18
Linen	2	2	1	1	6
Fur	23	3	–	1	27
Total	*69*	*12*	*1*	*2*	*84*

la, *marlota, paletoque*, *papahígo*, *sayo*). In almost 30 % of the cases, silk was combined with wool (silk for outer garments in 24.6 % of the items (*ropón, mongil, gonete* and *faldrilla*) and for lining in 5.3 % (habit and *gonete*). Both components were made in wool in 7 % of the items (*calzas*), and the remaining 10 % were six garments lined with linen (*skirt, smock, cotte, faldrilla, jubón*) with the exterior made from silk (2), linen (1), fustian (1) and wool (2).

Looking at the total of 27 garments lined with fur (row 4), 85 % of the outer fabrics were silk, and the lining was ermine or rabbit in 59 % of the cases. The fur for one item was to line a pair of gloves. For the other items, the fur was used as follows:

- ermine combined with silk (8 garments: ropa larga, mongil, gonete, mantillas, sayo);
- rabbit combined with silk (5) and wool (2) (7 garments: *hábitos, mongiles, ropón*);
- black *pena* combined with silk (3 garments: *ropones, mongil*);
- black *navarrisca pena* combined with silk (2 *ropones*);
- black *frisol pena* combined with silk (2 *mantillas*);
- *marta cibelina* (sable lining) combined with silk (2 garments: *gonete* and *sayo*);
- pena negra de romanea combined with wool (1 ropón);
- squirrel combined with wool (1 *hábito de seda*);
- pelleja de Romania.

Social stratum: the Queen, prince, nobility and the poor

We now dig a little deeper by social stratum. Although it is possible to measure the amount of fabrics in relation to other social groups (servers, guards, dames) and certain royal officials, we focus our analysis on those groups that offer the most reliable data: the Queen; the nobility (represented by the elder son of the Duke of Braganza, who was of similar age to the heir apparent); and the poor as dressed by the Queen on certain occasions.

Between 1492 and 1504, the Queen accounted for nearly 22 % of the total spent, which was slightly more than her 20 % total between 1483 and 1491. Silk represented three-quarters of that expenditure, and the remainder was linen, followed by wool. In quantity, 70 % of the fabrics used for the Queen was linen, followed, in order, by silk and wool (Table 8).

The data highlights what is already well known: silk was the fabric of the royalty to show wealth. In their domestic life, however, linen played a prominent role too, as bedding, tablecloths, towels, sheets, pillows, and mattresses.

For the comparison to Isabel, we have the data between 1492 to 1495 of the fabrics related to Prince Don Juan, the heir to the Crown, and Don Jaime de Braganza, the firstborn of a Portuguese nobleman who sought refuge in the court. Both boys were about the same age. Prince Don Juan used, on average, almost seven times as much fabric as Don Jaime, which cost nearly eight and a half times more than the amount spent on Don Jaime. The prince used an extensive array of expensive fabrics. In relative terms, he consumed less wool in both quantity and value but more linen, at least in quantity. Both Don Juan and Don Jaime used similar percentages of silk in quantity, but not value. High nobility often dressed in silk, but it was less expensive than the silk used for royalty [30, 53].

Of the silk fabrics purchased by the Royal House, the most expensive was brocade, followed by *altibajo*, *villutado* and *carmesí de pelo*. The most commonly used fabric was generic velvet, which represented half of the total number of *varas* and almost a similar percentage in value. Not surprisingly, two-thirds of the total expenditure was spent on the costly velvets and brocades. Satins, damasks and *cebtyes* together represented 38 % of silk purchases.

At the other end of the socio-economic ladder were the *pobres* (poor), which was the term used in *Accounts of the treasurer*. In actuality, they were *pobres de solemnidad* (beggars). We have taken into account fabrics for clothing donated by the Queen to nine poor women and 13 poor men that she dressed for special occasions, in particular for two annual festivities: Our Lady of March and the Last Supper (Maundy Thursday).

Each man was given between 6.5 and 7 *varas* (approx. 5.8 meters) of cheap *paño pardillo* and *buriel*, costing

Table 8
Consumption attributed to the Queen (1492-1504), and the Prince and Don Jaime (1492-1495)

Fiber	Queen		Prince		Don Jaime	
	Varas (%)	*Maravedis* (%)	*Varas* (%)	*Maravedis* (%)	*Varas* (%)	*Maravedis* (%)
Linen	70.20	14.93	59.56	6.71	47.13	7.15
Silk	22.27	75.21	28.32	81.16	27.60	66.27
Wool	7.27	9.77	10.83	12.07	25.27	26.58
Other	0.26	0.09	1.29	0.06	–	–
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*

Table 9
Woollen fabrics, colour and price in percentage of *varas* and *maravedís* (1492-1504)

	Quantity of fabrics per price group (%)			Value of fabrics per price group (%)		
	100-399 mrs / vara	400-999 mrs / vara	>1000 mrs / vara	100-399 mrs / vara	400-999 mrs / vara	>1000 mrs / vara
Black (*negro*)	21.45	9.54	10.10	24.52	8.98	10.02
Brown (*pardillo*)	20.25	0.52	0.00	15.06	0.47	0.00
Green (*verde*)	4.18	3.54	0.00	7.85	3.49	0.00
Blended (*combinado*)	3.26	3.80	1.79	2.80	3.41	1.68
Violet (*morado*)	1.55	8.17	7.10	2.90	8.57	7.02
White (*blanco*)	1.51	0.95	0.00	1.1	0.76	0.00
Blue (*azul*)	1.24	0.64	0.00	1.39	0.83	0.00
Red (colorado)	0.91	2.67	34.59	1.31	3.90	35.42
Pink (*rosado*)	0.28	1.07	3.14	0.44	0.79	3.21
Tawny (*leonado*)	0.24	0.33	0.00	0.16	0.34	0.00
Scarlett (*grana*)*	0.10	3.20	40.58	0.15	4.85	40.22
Golden (*dorado*)	0.10	0.60	0.00	0.09	0.55	0.00
Yellow (*amarillo*)	0.05	0.24	0.00	0.10	0.25	0.00
Snow-white (*nevado*)	0.00	1.97	0.00	0.00	1.93	0.00
Silver (*plateado*)	0.00	0.17	0.00	0.00	0.16	0.00
Deep blue (*turqués*)	0.00	0.03	0.00	0.00	0.03	0.00
Unknown	44.88	62.58	2.70	40.07	60.68	2.43
Total	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*	*100.00*

Note: It was noted an Orange Ruan but the price was not included.

* Expenditure in grana.

73-175 mrs/vara, and four additional *varas* (approx. 3.3 meters) of Bretagne linen costing 31 mrs/vara. Each woman received 9 *varas* (7.5 meters) of these same cheap woollen cloths at 73-78 mrs/vara and between 4.5 and 5.5 *varas* (approx. 4 meters) of Bretagne linen, also at 31 mrs/vara. The linen was to be used for shirts, and the wool for *sayos* and *capuces*. A donation was also made to one poor girl for a *saya* (cotte), caps and shoes for a total value of 500 *mrs* [36, p. 588].

Colours

According to Sigüenza, clothes differed according to social strata, gender, age, profession and religion (by iconography; e.g. Retablo de San Juan Bautista by Pedro García de Benabarre) [52, p. 360]. There is no doubt that clothing played important roles as instruments of power and prestige, and even as elements of propaganda. While it is now difficult to understand the symbolism in the donation of fabrics from kings to nobility or the effectiveness of sumptuary laws, it is clear that fabric marked stratifications – income, social position, and even religion [50, pp. 348-349]. This was also conveyed by the colour of the fabric. The accounts of the House of the Queen leave no doubt in this regard. The colours recorded in the accounts are not the same as we would identify today due to the quality of fabric, the dyes and the dyeing method used [32; 22, p. 69]. The purpose of this article is not to elaborate disquisitions, but to detail the fabrics used and to show how colour too marked social rank [54]. The significance of colours over history has changed, for example the use of blue in the 13th century and of black in the 15th century) [55]. According to Abel [26, p. 447], even if there were few new dyes, the transfer of knowledge improved with changes in transportation. Dyes are mostly water soluble, which allow colours to impregnate the fibres. Before 19th century, dyes were extracted from nature (vegetable or animal; e.g. leaves and lichens or insects and mollusks, respectively). This changed with the arrival of chemical substitutes and invention of coal tar dyes [31, p. 414].

The *Accounts of the treasurer* also provides colours for silk and wool, but rarely for linens, as those were mostly used bleached or in its natural hue. For wool, we established a classification: from 100-399, 400-999, and above 999 mrs/vara. Data for the middle category is limited because we found information for only 37 % of the *varas* in that group (Table 9).

Common folk dressed in black, sparrow and brownish-grey, which are the natural colours of wool. Nearly 50 % of low-quality fabrics were not dyed.

For expensive fabrics, red shades were predominant (75 % of *varas*). González Arce pointed out that only the king was allowed to wear scarlet [56, p. 124]. Red was used as a liturgical colour to refer to the blood of Christ and to the Holy Spirit as a flame [25, p. 245]. Reds were used in the Middle Ages for royalty and nobility, who appreciated the colour not only for its symbolism but also because the dyes were expensive. The late medieval recipes of dyers, such as those collected by Joanet Valero in 1497, show the importance of red in all its ranges, including purple: three-quarters of the recipes are for red, while black and green account for only 10 % each of the other recipes [25, p. 255 note 40].

What is noticeable is the minimal to zero use of blue, yellow, tawny, snow-white, silver, turquoise. As an anecdote, yellow and green were associated in *Accounts of the treasurer* with "Crazy woman" [36, p. 401], although they were not always connected to madness. Yellow does not appear in expensive cloths, and it had a negative and pejorative meaning linked not only with Jews and Muslims but also with disease, avarice and betrayal [57, 25].

In the most expensive silks, we found predominately black (in 45 % of the cases), crimson or red (18 %) and green (11 %). One of these was used in at least 75 % of the *varas* (Table 10). Since silk was only worn by royalty and nobility, black fit well with the message they wanted to convey, as many European nobles wore it, probably from the influence of the Italian bourgeoisie [23, pp. 188-189]. Black was also the colour used by the clergy. It was a difficult and expensive colour to obtain. Only Benedictine monks managed to create an intense and luminous black dye at the end of the 14th century and the beginning of the 15th century [58-59]. The main problem with black dyes was that they tended to erode fibres and to fade. The discovery of America would bring a new natural black

Table 10
Silk fabrics sorted by colour, in *varas* (%) (1492-1504)

	Aceituní	Altibajo	Brocade	Çebty	Damask	Satin	Tafefta	Velvet	Villutado	Rest	Total
Black (negro)	33.9	0.0	14.2	35.4	27.3	36.4	11.7	62.1	15.7	1.6	45.0
Crimson (*carmesí*)	37.5	53.2	50.5	27.0	2.9	23.2	0.0	14.4	11.8	29.7	18.5
Green (*verde*)	7.4	15.9	0.3	4.9	15.6	19.6	1.5	10.6	14.4	0.7	11.3
Violet (*morado*)	16.7	0.8	16.5	5.9	3.0	10.8	0.0	4.5	23.6	9.4	6.4
White (*blanco*)	0.0	0.0	16.6	10.2	26.4	4.3	0.0	0.2	0.0	0.0	5.7
Blended (*combinado*)	0.0	0.0	0.0	0.5	5.5	0.0	56.1	0.6	34.4	11.7	2.3
Blue (*azul*)	4.6	13.9	0.0	2.2	3.4	0.6	0.0	1.1	0.0	0.0	1.6
Brown (*pardillo*)	0.0	0.0	0.3	4.9	3.5	1.3	0.0	0.0	0.0	0.0	1.1
Deep Blue (*turqués*)	0.0	0.0	0.0	1.8	2.5	0.4	7.50	0.0	0.0	0.0	0.7
Scarlett (*grana*)	0.0	0.0	0.0	3.1	0.0	0.0	20.0	0.0	0.0	0.0	0.6
Yellow (*amarillo*)	0.0	16.2	0.0	1.6	0.0	0.9	0.0	0.0	0.0	0.0	0.6
Tawny (*leonado*)	0.0	0.0	0.8	0.1	0.0	0.8	0.0	0.6	0.0	0.0	0.5
Orange (*naranjado*)	0.0	0.0	0.0	1.1	1.0	0.7	0.0	0.0	0.0	0.0	0.3
Red (colorado)	0.0	0.0	0.0	0.0	2.4	0.0	3.0	0.0	0.0	0.0	0.3
Blood-red (*encarnado*)	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.1
Unknown	0.0	0.0	0.7	1.3	6.5	0.1	0.2	5.9	0.0	46.8	4.9
Total	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*	*100.0*

dye, the *Palo de Campeche*, which was a less expensive dye and of great quality [39, p.7].

Reds were easier to achieve than black. The female kermes was used to make the "first luxury dye of the Middle Ages" [26, p. 440]. Before the arrival of the cochinille from America, kermes vermilio and kerria lacca were the most common insects used for making red dye [60, p. 127]. At the time, travelers seemed to identify *terciopelo carmesí* (crimson velvet) with Spain. Thus, the Moorish influence was also present [61, p. 13].

With the discovery of America and South American woods, Europe found abundant sources for new ways of dyind red. Since 13th century an expensive red dye made from the *Guilandina Equinea* came from the East Indies and Sri Lanka. However, a tree of the same species (brazilwood) was discover in South America and became one of the most lucrative trades from the Portuguese colony to the European markets. On the other hand, cochineal insects, which lived on cacti in New Spain, provided also a red dye, during the period of the Catholic Kings, as did the *coccus ilicis*, also known as kermes, which lived on Mediterranean evergreen oaks.

More complex than red was the green, which together with the black is present in all kinds of tissues. In fact, black, red and green were used on all types of fabrics. In the case of the taffeta, all colours except crimson and purple were used (Table 10). For yellow, the dyes most likely came from reseda, an herbaceous plant with yellow flowers, along with *fustete* (young fustic), safflower and saffron [26, p. 441].

Data collected from 1492 gives the impression that colour was also used for some linens, a fabric most often used unbleached and without colour. It is likely that very white linens were the most expensive. In the case of the most used linen fabrics (Brittany, naval and linen without specific description), 7 % were dyed, some in blue. Twelve percent of naval linen and 30 % of the other linen had no description of colour. The listed colours include black and blue, followed by green, yellow and tawny. Sánchez Ortiz [62] and Piponnier [23] pointed out that blue emerged strongly in medieval Europe to compete with red; between 1180 and 1250, dyers achieved an intense and brilliant blue. In the 11th and 13th centuries, Europe used blue as it was associated with the light of God and with the Virgin Mary, who appears in iconography wearing a mantle or dress of that colour [63, p. 22]. Improvements were made in the 14th century by mixing lapis lazuli with mineral wax, oil and resin to create the colour ultramarine, also used in paintings associated with sacred objects of the Virgin Mary. "Lapis Lazuli was known as the *Queen of pigments* because it comes from a semi-precious stone that was pulverise and use as a pigment from Egypt to China" [29, p. 449].

White is also noted, which probably means that the items had been treated in a special way to lighten them, as most white fabrics were not dyed at all. The mention of dying linen could mean either a new fashion or just further details of the accounting officer.

Conclusion

The purpose of our research was to use the information provided by Gonzalo de Baeza to create a systematic database on the evolution of fabric usage in the Royal House of Isabel I by type, value, quantity, social class and colours.

In line with Zalama [38], we can ascertain that the House of Isabel I was not austere. While the most used fabric was the less expensive linen, it was used for bedding, tablecloths and napkins, and wrappings to move household items, or for only partially visible garments (such as shirts). Linen's significance during the period in general, however, has gone largely unnoticed because post-mortem inventories tended not to include it, as such garments were mostly donated to the poor or destroyed for sanitation reasons. However, it is also important to note that archaeological finds and iconography shows the use of shirts and smocks by all classes. Notwithstanding, it is necessary further research.

The advantages of linen are many, the most obvious being its durability and resistance to wear and tear [64]. Another great advantage is that it stays light and cool in summer and absorbs perspiration, making it ideal for bedding. Flax is one of the few fibres that can eliminate and neutralize odours, washable and widely produced and available throughout Europe, which is why it was used in the home and as undergarments [65]. Linen was thus also an ideal fibre for furnishing textiles (*holanda* and *lienzo encerado* or oil-linen for windows [36, pp. 42, 261]) and utilitarian objects (e.g. tablecloths).

In the *Accounts of the treasurer*, nobility and royalty used linen, especially expensive Holland linen, for shirts. Gonzalo de Baeza offers no information about linen's importance among other social groups, although we can assume that it was important in the bedroom and common in undergarments, mostly, but rarely used in outer layers. Home linen was very common, even if it was rarely marketed or commercialised like wool and silk fabrics. Silk was reserved for royalty and nobility while wool was used by those of lesser means. Scott noted that "wool was made into every kind of outer garment, from stockings to hoods to gowns", and was associated with lower income [47, p. 17]. Linen seems to have been present at all social levels due to its versatility [65, p. 138].

According to Bernis, only *calzas* and *bragas* were considered undergarments and were limited in their use [48]; thus most outer garments were probably in direct contact with the skin. Guindon poins out, quoting Vigarello, "le linge de dessous existait déjà au Moyen Âge, mais que son statut était si peu important qu'on n'en possédait qu'un. Son seul intérêt consistait à être confortable pour la peau" [66-67]. Seen only in the upper classes were garments with linings, and only those garments of great value. Lining could be fur – from ermine to cats – which was appreciated not only for its rich appearance but also for its warmth (until the 12th century, fur was used for its warmth, not for fashion or status). The

colour of the fur became an important marker, as did the fur's softness (e.g. for blankets).

The use of expensive linens and expensive fabrics and furs as linings suggests that, apart from highlighting their social standing through clothing, royalty and nobility likely considered fur and other lining fabrics for both comfort and protection against the cold. However, adornment and protection from the cold were not the same thing [68]; the quality of the furs used and their particular use in garments made clothing both a fashion and status statement.

Fur and silk competed as the luxury materials for the upper class, but silk would eventually become more popular. This explains the increase in the use of silks as incomes increased: "la fourrure gardera ses vertus contre le froid, mais la soie lui fera au XVème siècle une sérieuse concurrence sur le marché du luxe" [68].

The colour of garments was also a significant element: it conveyed social standing, up or down, through the use or absence of expensive dyes. It is possible that colour had a further symbolic role, but our statistical data reveals that, while other colours were used, variations of red and black dominated.

The type of dyed fibre also held relevance. Black, crimson-red and green, respectively, were the dominant colours for silks. For expensive woollen cloths, the dominant colour was *grana* (red dye), and black seems to have been the dominant colour for cheap woollen fabrics. From *Accounts of the treasurer*, a relevant percentage of cheap and medium-priced fabric did not include mention of colour, thus no other firm conclusions can be drawn. The predominant colours used for expensive woollen fabric were not different from those used for silk, although their order changed: scarlet, red and black were most often used for expensive woollen fabric, while black and red were used for silks. Thus, shades of red and black were always dominant, but they swapped places according to fabric being dyed.

Acknowledgements

We acknowledge research funding from Ministerio de Economía, Industria y Competitividad (Agencia Estatal de Investigación)/Fondo Europeo de Desarrollo Regional (FEDER), HAR 2016-78026-P. We are grateful to Ana Cabrera and Eva Fernández de Pinedo, who kindly provided technical support. *We* are also very *thankful to the reviewers* for their comments and suggestions.

ORCID

Nadia Fernández de Pinedo
https://orcid.org/0000-0001-6708-1480

References

1 Aymard, M.; Romani, M. A. (eds.), *La Cour comme institution économique*, París, (1998).

2 Adamson, J. (ed.), *The Princely Courts of Europe. Ritual, Politics and Culture Under the «Anden Régime»* 1500-1750, London, (1999).

3 Bernáldez, A., *Historia de los Reyes Católicos Don Fernando y Doña Isabel*, Luciano de la Calzada, Madrid (1946).

4 De La Torre, A., *La Casa de Isabel la Católica*, CSIC Patronato Marcelino Menéndez Pelayo, Madrid (1954).

5 Ladero Quesada, M. A. (ed.), *La Sociedad Castellana a Finales del Siglo XV*, DYKINSON, Madrid (2004).

6 Ladero Quesada, M. A., 'La hacienda real de Castilla en 1504. Rentas y gastos de la Corona al morir Isabel I', *Historia, Instituciones, Documentos*, **3** (1976), 326-330.

7 Ladero Quesada, M. A., *La Armada de Flandes: un Episodio en la Política Naval de los Reyes Católicos (1496-1497)*, Real Academia de la Historia, Madrid, (2003).

8 Leroy, B., *L'Historien et son Roi. Essai sur les Chroniques Castillanes, XIV-XV siécles*, Madrid, (2013).

9 Martínez Ruiz, E., *Tradición y Novedad en la Organización Político-administrativa de la Corona de Castilla en el Reinado de los Reyes Católicos*, Chronica Nova, Madrid (1993).

10 Pérez, J., *Isabel y Fernando. Los Reyes Católicos*, Madrid (1988).

11 Valdeón Baruque, J., *Sociedad y Economía en Tiempos de Isabel la Católica*, Valladolid (2002).

12 Hernández Martínez, P., 'La memoria de la historia oficial: Crónicas y cronistas en la España de los Reyes Católicos', *Revista EPCCM* **15** (2013) 235-268.

13 Braudel, F., *Civilisation Matérielle, Économie et Capitalisme, XVe-XVIIIe siècle. 1. Les Structures du Quotidien: le Possible et l'Impossible*, Armand Colin, Paris (1979).

14 Rumeu de Armas, A., *Itinerario de los Reyes Católicos (1474-1516)*, CSIC, Madrid, (1974).

15 Fernández de Córdova Miralles, A., 'Sociedad cortesana y entorno regio', *Medievalismo: Boletín de la Sociedad Española de Estudios Medievales* **13-14** (2004) 49-78.

16 Pelaz Florez, D., 'La imagen de la reina consorte como muestra de poder en el reino de Castilla durante el siglo XV. Construcción y significado', *Medievalismo: Boletín de la Sociedad Española de Estudios Medievales* **23** (2013) 265-90.

17 Levas Cuevas, J., 'El vestido y las leyes suntuarias como configuradores de la industria textil. La collación de Santa María en la Córdoba Bajomedieval', Ámbitos: *Revista de Estudios de Ciencias Sociales y Humanidades* **3** (2009) 11-20.

18 Bernis, C., Trajes y Modas en la España de los Reyes Católicos I. Las Mujeres, 2 vols., C.S.I.C., Madrid (1978).

19 Sempere y Guarinos, J., *Historia del Luxo y de las Leyes Suntuarias de España*, vol. 1, Madrid (1788).

20 Gérard-Marchant, L., 'Compter et nommer l'étoffe à Florence au Trecento (1343)', *Médiévales: Langue, Textes, Histoire* **14**(29) (1995) 87-104, https://doi.org/10.3406/medi.1995.1339.

21 Rodríguez-Velasco, J. D., *Ciudadanía, Soberanía Monárquica y Caballería: Poética del Orden de Caballería*, Akal, Madrid (2009), p.128.

22 Buss, C., 'Tessuti e colori svelati. La «*magna curia*» mantovana del 1340. Glossario', in *I Gonzaga: Cavalieri, Vesti, Argenti, Vino: La «Magna Curia» del 1340*, ed. C. Buss & D. Ferrari, Silvana, Milano (2016).

23 Piponnier, F., *Costume et Vie Sociale. La Cour d'Anjou. XIVe-XVe Siècles, Mouton*, Paris-La Haye (1970), pp.188-196.

24 Hayward, M., *Rich Apparel, Clothing and the Law in Henry's VII England*, Ashgate, Burlington (2009), pp.17-21.

25 de Sas van Damme, A., 'El amarillo en la Baja Edad Media. Color de traidores, herejes y repudiados', *Estudios Medievales Hispánicos* **2** (2013) 241-76.

26 Abel, A., 'The history of dyes and pigments: From natural dyes to high performance pigments', in *Colour Design: Theories and Applications,* ed. J. Best, Woodhead Publishing, Cambridge (2012) 433-470.

27 Ferreira, M. J., 'Asian textiles in the *Carreira da* Índia: Portuguese trade, consumption and taste', *Textil History* **46**(1) (2015) 147-168, https://doi.org/10.1080/00404969.2015.1121663.

28 Cardon, D., *Natural Dyes: Sources, Tradition, Technology and Science*, Archetype, London (2007).

29 Iradiel Muruagarren, P., *La Evolución de la Industria Textil Castellana en los Siglos XIII-XVI: Factores de Desarrollo, Organización y Costes de la Producción Manufacturera en Cuenca*, Universidad de Salamanca, Salamanca (1974), pp.122-130.

30 Piponnier, F.; Mane, P., *Se Vêtir au Moyen Âge*, Biro, Paris (1995), p.73, 131.

31 Schneider, J. 'Peacocks and penguins: the political economy of European cloth and colors', *American Ethnologist* **5**(3) (1978) 413-447, https://doi.org/10.1525/ae.1978.5.3.02a00010.

32 Finlay, R., 'Weaving the rainbow: visions of color in world history', *Journal of World History* **18**(4) (2007) 383-431, https://doi.org/10.1353/jwh.2008.0001.

33 González Marrero, M.C., *La Casa de Isabel la Católica. Espacios Domésticos y Vida Cotidiana*, Institución Gran Duque de Alba, Ávila (2006).

34 Saénz de Miera, J., 'Instrumentos suntuarias para una nueva dignidad real: útiles y objetos precisos pertenecientes a Isabel I de Castilla', in *Isabel la Católica la Magnificencia de un Reinado: Quinto Centenario de Isabel la Católica*, *1504-2004*, Sociedad Estatal de Conmemoraciones Culturales, (2004) 155-168.

35 de la Torre y del Cerro, A., *Testamentaria de Isabel la Católica,* Instituto Isabel la Católica de Historia Eclesiástica, Valladolid (1968).

36 de la Torre, A.; de la Torre, E. A. (ed.), *Cuentas de Gonzalo de Baeza, Tesorero de Isabel la Católica,* vol. 1 (1477-1491) and vol. 2 (1492-1506), CSIC, Patronato Menéndez Pelayo, Madrid (1955).

37 Fernández de Pinedo Fernández, E.; Moral Zuazo, M. P., 'Vísteme despacio... El consumo de tejidos por la Casa Real de Isabel I a fines del siglo XV', in *Modernidad de España. Apertura Europea e Integración Atlántica*, ed. A. M. Bernal, Marcial Pons, Madrid (2017) 569-596.

38 Zalama Rodríguez, M.A. 'Oro, perlas, brocados...: la ostentación en el vestir en la corte de los Reyes Católicos', *Revista de Estudios Colombinos* **8** (2012) 13-22.

39 Cabrera, A., 'Los tejidos como patrimonio: investigación y exposición', *Revista del Instituto del Patrimonio Histórico Español* **5** (2005) 5-19.

40 *Diccionario de Autoridades*, Real Academia Española, 3 vols., facsimile, Gredos, Madrid (1963).

41 Corominas, J.; Pascual, J. A., *Diccionario Crítico Etimológico Castellano e Hispánico*, 6 vols., Gredos, Madrid, (1980-1991).

42 Covarrubias, S., *Tesoro de la Lengua Castellana o Española,* facsimile, Alta Fulla, Barcelona (1998).

43 Castany Saladrigas, F., *Diccionario de Tejidos: Etimología, Origen, Arte, Historia y Fabricación de los Más Importantes Tejidos Clásicos y Modernos*, Gustavo Gili, Barcelona (1949).

44 Gual Camarena, M., *Vocabulario del Comercio Medieval,* Universidad de Murcia (2014), http://www.um.es/lexico-comercio-medieval (accessed 2018-5-18).

45 Nemnich, P. A., *An Universal European Dictionary of Merchandise, in the English, German, Dutch, Danish, Swedish, French, Italian, Spanish, Portuguese, Russian, Polish & Latin Languages*, J. Johnson, London (1799).

46 Beck, S.W., *The Draper's Dictionary: a Manual of Textile Fabrics: their History and Applications,* The Warehousemen & draper's journal office, London (1882), https://archive.org/details/drapersdictionar00beck (accesed 2018-5-18).

47 Scott, M., *Fashion in the Middle Ages*, Getty Publications, L.A. California, (2011).

48 Bernis, C., *Indumentaria Medieval Española*, Instituto Diego Velázquez, CSIC, Madrid (1953), pp. 35-53.

49 García Marsilla, J. V., 'La moda no es capricho. Mensajes y funciones del vestido en la Edad Media', *Vínculos de Historia. Revista del Departamento de Historia de la Universidad de Castilla-La Mancha* **6** (2017) 71-88, https://doi.org/10.18239/vdh.v0i6.269.

50 Martínez, M., 'La creación de una moda propia en la España de los Reyes Católicos', *Aragón en la Edad Media* **19** (2006) 343-380.

51 Descalzo, A., 'Vestirse a la moda en la España moderno', *Vínculos de Historia* **6** (2017) 105-134, https://doi.org/10.18239/vdh.v0i6.271.

52 Sigüenza Pelarda, C., 'La vida cotidiana en la Edad Media: la moda en el vestir en la pintura gótica', in *La Vida Cotidiana en la Edad Media: Actas de la VIII Semana de Estudios Medievales: Nájera, del 4 al 8 de agosto de 1997*, Instituto de Estudios Riojanos (1998) 353-368.

53 Sivéry, G., *La Baja Edad Media: ¿Espejismos Mediterráneos o Realidades Atlánticas? (Siglos XIII-XV)*, Edaf, Madrid (1976).

54 Gheerbrant, A.; Chevalier, J., *Dictionnaire des Symboles. Mythes, Rêves, Coutumes, Gestes, Formes, Figures, Couleurs, Nombres,* 2nd ed., Robert Laffont S.A. – Ed. Jupiter, Paris (1982), pp. 671-674.

55 Pastoureau, M., *Jésus chez le Teinturier. Couleurs et Teintures dans l'Occident Médiéval, Le Léopard d'Or*, Paris (1997).

56 González Arce, J.D., *Apariencia y Poder: la Legislación Suntuaria Castellana en los Siglos XIII y XV*, Universidad de Jaén, Jaén (1998).

57 Hickey, H. 'Medical diagnosis and the colour yellow in early Modern England', *E-rea*, **12**(2) (2015), https://doi.org/10.4000/erea.4413.

58 Pastoureau, M., 'Du bleu au noir. Éthiques et pratiques de la couleur à la fin du Moyen Âge', *Médiévales: Langue, Textes, Histoire* **14** (1988) 9-21, https://doi.org/10.3406/medi.1988.1097.

59 Pastoureau, M., 'Jésus teinturier. Histoire symbolique et sociale d'un métier réprouvé', *Médiévales: Langue, Textes, Histoire* **29** (1995) 47-63, https://doi.org/10.3406/medi.1995.1336.

60 Gayo, M. D.; Arteaga, A. 'Análisis de colorantes de un grupo de tejidos hispanomusulmanes', *Bienes Culturales* **5** (2005) 123-145.

61 Silva Santa-Cruz, N., 'La Corte de los Reyes Católicos y el reino nazarí. Permeabilidad cultural e intercambios artístico', in *El Arte en la Corte de los Reyes Católicos. Rutas Artísticas a Principios de la Edad Moderna*, ed. C. Checa Cremades & B. García García, Fundación Carlos de Amberes, Madrid, (2005) 272-282.

62 Sánchez Ortiz, A., 'El color: símbolo de poder y orden social. Apuntes para la historia de las apariencias en Europa', *Espacio, Tiempo y Forma. Serie IV, Historia Moderna* **12** (1999) 321-354.

63 Pastoureau, M.; Simonnet, D., *Breve Historia de los Colores*, Ediciones Paidós, Barcelona (2006).

64 Paddock Hess, K., *Textile Fibers and Their Use*, J.B. Lippincott Co., New York (1954).

65 Fennell Mazzaoui, M., *The Italian Cotton Industry in the Later Middle Ages, 1100-1600,* Cambridge University Press, Cambridge (1981).

66 Guindon, A., *L'Habillé et le Nu: Pour une* Éthique *du Vêtir et du Dénuder : Essai*, University of Ottawa Press, Ottawa (1997).

67 Vigarello, G., *Le Propre et le Sale. l'Hygiène du Corps Depuis le Moyen* Âge, Seuil, Paris (1985).

68 Favier, J., *Le Bourgeois de Paris au Moyen Âge*, Tallandier, Paris (2015).

Received: 2018-6-16
Revised: 2018-11-30
Accepted: 2018-12-3
Online: 2019-1-29

Estudos sobre têxteis históricos
Studies in historical textiles
A. Serrano, M. J. Ferreira, E. C. de Groot (ed.)

Artículo / Artigo / Article

Modelos orientales en la ornamentación textil andalusí – siglos XIII-XV

Laura Rodríguez Peinado

Departamento de Historia del Arte, Facultad de Geografía e Historia, Universidad Complutense de Madrid, España
lrpeinado@ghis.ucm.es

Resumen
Los tejidos andalusíes desarrollaron un repertorio decorativo de origen oriental. En la segunda mitad del siglo XII se produjo un cambio en la decoración textil que se ha asociado con la religiosidad de los almohades, la nueva dinastía reinante. Asimismo, se ha considerado que la producción textil del periodo nazarí es singular y se ha relacionado con la decoración arquitectónica del periodo, pero la producción textil andalusí de los últimos siglos de la Edad Media está relacionada con los cambios decorativos que se producen a partir de la difusión de tejidos procedentes del centro de Asia, que influyen en la producción de los talleres de la Cuenca del Mediterráneo.

Palabras clave
Textiles andalusíes
Reevaluación de la decoración textil
Panni tartarici
Tejidos almohades
Tejidos nazaríes

Modelos orientais na ornamentação têxtil andaluza – séculos XIII-XV

Resumo
Os tecidos andaluzes desenvolveram um repertório decorativo de origem oriental. Durante a segunda metade do século XII ocorreu uma mudança na decoração têxtil, a qual tem vindo a ser associada com a religiosidade dos Almóadas, a nova dinastia reinante. Além disso, tem sido considerado que a produção têxtil do período Nasrida é original e tem sido relacionada com a decoração arquitectural. Contudo, a produção têxtil andaluza dos últimos séculos da Idade Média está relacionada com as mudanças decorativas produzidas através da difusão de tecidos provenientes da Ásia Central, os quais influenciaram a produção das oficinas da bacia do Mediterrâneo.

Palavras-chave
Têxteis andaluzes
Reavaliação de decoração têxtil
Panni tartarici
Tecidos almóadas
Tecidos nasrida

ISSN 2182-9942

Conservar Património **31** (2019) 67-78 | https://doi.org/10.14568/cp2018026
ARP - Associação Profissional de Conservadores-Restauradores de Portugal
http://revista.arp.org.pt

Oriental patterns in Andalusi textile ornamentation – 13th-15th centuries

Abstract
Andalusi textiles developed a decorative repertoire of oriental origin. In the second half of twelfth century there was a change in textile decoration. This change has been associated with the religiosity of the Almohads, the new dynasty. Also, it has been considered that the textile production of the Nasrid period is unique and has been related to the architectural decoration, but the Andalusi textile production of the last centuries of the Middle Ages is related to the decorative changes that are produced from the dissemination of fabrics from central Asia, which influence the production of workshops in the Mediterranean Basin.

Keywords
Andalusi textiles
Re-evaluation textile decoration
Panni tartarici
Almohad fabrics
Nasrid fabrics

Producción textil en al-Andalus

La producción textil fue una de las industrias más prósperas de al-Andalus desde que, a mediados del siglo VIII, se fuera implantando la sericultura y una incipiente fabricación en la que participaron tejedores llegados desde diferentes centros orientales que introdujeron sus prácticas en la tejeduría y el repertorio decorativo que les era afín, teniendo en cuenta que los escasos restos textiles visigodos conservados no facilitan el conocimiento de sus procedimientos técnicos y modelos decorativos [1; 2, p. 25]. La influencia oriental siempre estuvo presente en los diseños textiles andalusíes. En los primeros siglos con clara filiación con Egipto, Siria, Bizancio y las telas ricas procedentes de Bagdad. Los intercambios comerciales facilitaron que estas telas fueran imitadas en su técnica y diseños en los telares andalusíes, generándose una potente industria que difundió sus productos tanto a los territorios cristianos del norte peninsular, y de ahí al resto de los territorios europeos donde fueron usados y reutilizados como objetos de gran lujo, como a Oriente – desde Egipto a Siria, y territorios del medio Oriente –, donde estos tejidos gozaron de gran aprecio.

Desde su fundación en el siglo X, pero sobre todo a partir de la época taifa, en el siglo XI, cuando se produce la desintegración del califato cordobés, la principal industria textil de al-Andalus se ubicó en Almería, ciudad con uno de los puertos más importantes de la península donde llegaban barcos cargados de exóticas mercancías y salían repletos de sedas, cerámicas, mármoles y otros objetos de lujo. Al-Zurhi, en el siglo XII, define a la ciudad como la alcaicería y atarazana de al-Andalus donde se fabricaban tejidos de excelente factura perfectos en su fabricación [3, pp. 80-81]. Al Idrisi cuenta en el mismo siglo que en la ciudad había ochocientos telares para confeccionar tejidos de seda, mil para túnicas y brocados y otros tantos para ciclatones – tejidos de seda y oro [4, pp. 169-170]. Los mismos autores comentan como sus brocados – entretejidos con hilos metálicos – se comparaban a los conocidos *bagdadies* o *attabies*, tejidos procedentes de Bagdad, caracterizados por presentar su decoración contenida en medallones que encierran animales en posición simétrica, cuyos códigos decorativos habían sido adoptados por la industria textil islámica inspirándose en modelos bizantinos y sasánidas [5]. Parece evidente que el importante puerto y su floreciente industria textil favorecieron no solo el intercambio de mercancías, sino también de técnicas y de códigos decorativos, como se pone de manifiesto en estas telas de imitación que obligaron a incluir en los tratados de *hisba* regulaciones sobre la práctica de las imitaciones y las falsificaciones [6, p. 183]. Los baldaquíes o diaspros, como también se los conoce, realizados a la manera de Bagdad [5, p. 106], presentan singularidades desde el punto de vista técnico, como es la utilización de hilos de oro entorchados resaltando algunos detalles como las cabezas de los animales, y la grafía de las inscripciones presenta detalles propios de la escritura andalusí [7, p. 34; 8, p. 388]. Fueron utilizados para diferentes fines entre los cristianos, lo que ha permitido que se conserve un importante número de piezas procedentes, principalmente, de relicarios y ajuares funerarios (Figura 1).

Producción textil en los últimos siglos de al-Andalus

El gusto por estos tejidos con la decoración contenida en medallones de gran tamaño fue declinando a favor de nuevos repertorios ornamentales que se fueron imponiendo en la segunda mitad del siglo XII. En primer lugar el tamaño de los medallones tendió a reducirse, como se pone de manifiesto en piezas procedentes de los enterramientos del monasterio de Santa María la Real de Huelgas en Burgos, como en la tapa del ataúd de Fernando de la Cerda o el forro del ataúd de María de Almenar [9,

pp. 26-27, 90-91], y los motivos figurativos fueron cediendo el paso a los geométricos y vegetales, aunque no llegaron a desaparecer. La moda de los tejidos con la decoración contenida en medallones parecía agotada, pero la gran demanda de los reinos cristianos de estas *palia rotata* llevó a la imitación de sedas andalusíes en Lucca en el siglo XIII, exportadas a Castilla desde Génova y mencionadas en la documentación como *spanish bagadelli* [10, pp. 218, 228-229]. Las imitaciones revelan un importante comercio mediterráneo y la alta productividad de las sedas de al-Andalus impulsó la proliferación de imitaciones en distintos talleres.

Como iremos viendo, los nuevos esquemas compositivos y repertorios decorativos que se fueron imponiendo en la segunda mitad del siglo XII están en relación con los tejidos procedentes de Oriente Medio y Asia central que revelan la internacionalización de la producción textil en el periodo medieval y supusieron un cambio de gusto en la producción de la Cuenca del Mediterráneo, tanto en al-Andalus como en las incipientes manufacturas italianas (Figura 2).

En el estudio de los tejidos andalusíes se han relacionado estos cambios con la llegada al poder en al-Andalus de la dinastía almohade de origen bereber, considerándose la producción descrita propia de la época almorávide, teniendo en cuenta que los textiles ibéricos medievales se han clasificado acorde a las etapas históricas de la presencia del Islam en la Península: califales, taifas, almorávides,

Figura 1. Tejido de Santa Librada, primera mitad del siglo XII, catedral de Sigüenza, Guadalajara.

Figura 2. Fragmento de textil procedente de un manto, Irán, siglo XI-XII, Metropolitan Museum of Art, Nueva York. Fotografía: Metropolitan Museum of Art, Nueva York (https://www.metmuseum.org/art/collection/search/450728).

almohades y nazaríes [8, 11-12]. Es cierto que a partir de mediados del siglo XII los motivos y los esquemas compositivos de los textiles varían predominando composiciones en red de rombos, patrones simétricos, medallones y bandas alternas de diferente anchura que contienen motivos diversos junto a inscripciones con bendiciones y alabanzas, pero estos diseños no son exclusivos de la producción andalusí, advirtiéndose similitudes en las producciones coetáneas de otras manufacturas, aunque mantiene singularidades en técnica, cromatismo, elementos ornamentales y epigrafía, como se puede observar cuando se realizan estudios comparativos.

Según narra Ibn Jaldun en el siglo XIV, los primeros califas almohades se negaron a vestir prendas de seda y oro obedeciendo al ideal de sencillez de su fundador Ibn Turmart, por lo que incluso suspendieron el cargo de inspector de *tiraz*, taller real donde se fabricaban los tejidos de lujo para abastecer a la corte. Abu Yusuf Yacub mandó suprimir de la indumentaria los vestidos de seda y prohibió usar a las mujeres bordados suntuosos, a la vez que ordenó la venta de las ropas de seda y oro almacenados en los *tiraz* [4, p. 8]. Estas noticias se han interpretado como un parón en la producción textil andalusí en la segunda mitad del siglo XII debido a la aversión que los califas mostraban ante los tejidos ricos, pero las ventas de tejidos pudieron deberse más bien a la animadversión que los almohades mostraban por sus antecesores que a la riqueza de los paños, como opina Rosser-Owen [7, p. 45], porque la producción de tejidos ricos no cesó, como se puede deducir a partir del análisis técnico y decorativo de los textiles clasificados en el siglo XIII, que dan muestra de la continuidad de una industria que no habría podido resurgir con tanta celeridad si hubiese sido totalmente desmantelada.

En 1147 Almería fue reconquistada por Alfonso VII de Castilla, coincidiendo con el declive del imperio almorávide, pero fue ganada por la causa musulmana de nuevo en 1157 por la nueva dinastía. La breve ocupación cristiana no debió suponer el declive de la actividad comercial y artesanal de la ciudad, porque al volverse a conquistar para el Islam se reactivó la industria textil, que floreció hasta que en 1288 el sitio pasó a manos de los nazaríes y sus telares fueron desbancados por los de Granada. Los telares almerienses siguieron incorporando las novedades técnicas y decorativas en su producción, habida cuenta de que esta constituía una de las fuentes de riqueza más importantes del lugar. Los ideales de sencillez de los califas almohades respecto a los tejidos ricos pudieron afectar a la producción oficial, que sufrió un parón y un periodo de estancamiento, pero no supuso la supresión de una producción de lujo en talleres privados y con un alto grado de profesionalización, seguramente la mayoría de reducidas dimensiones y especializados en un tipo de tejido [13, pp. 80-81], que había consolidado la comercialización de estos bienes suntuarios tanto en Oriente como en los territorios cristianos occidentales. En este sentido compartimos la idea de Cameron, que habla del apego al *status quo* en la utilización de un repertorio decorativo independientemente de los cambios de religión [14, p. 80], a los que añadimos también políticos.

Desde el rigor religioso se ha justificado la escasa producción textil atribuida a la segunda mitad del siglo XII,

periodo del que se conserva un menor número de piezas, y el cambio de decoración de los tejidos clasificados como almohades en el primer tercio del siglo XIII. Respecto a la primera cuestión, la fabricación no debió disminuir, puesto que la puesta en marcha de una producción especializada y altamente competitiva no habría soportado su desmantelación y una reactivación tras un periodo de abandono. Es complicado pensar que el comercio exterior desapareciera y con este toda influencia foránea. Y en relación con el cambio de los códigos decorativos, ligado a esa falta de influencia externa se ha argumentado que el repertorio textil que se impone en la producción del siglo XIII se nutre de motivos inspirados en el arte andalusí anterior como signo de legitimación. Pero si bien se pueden establecer relaciones con elementos decorativos de algunas piezas textiles de este periodo y con objetos andalusís anteriores o contemporáneos en distintos materiales y técnicas, lo cierto es que los cambios ornamentales, donde se observa una desaparición casi total de los tejidos que imitaban la producción de Bagdad (baldaquíes) muy de moda en el siglo XII, pudo deberse fundamentalmente al cambio de gustos que se observa en la ornamentación textil coetánea mediooriental y centroasiática. Por tanto, habría que considerar que los tejidos del siglo XIII de producción andalusí siguen las modas textiles vigentes y difundidas a través de la comercialización de estos productos de lujo, que se imitarían e interpretarían en los centros de Almería, y otros como Málaga, Murcia, Granada y Sevilla para poder competir con las telas orientales aunque, evidentemente, mantenían su carácter singular en el repertorio, el color y la diversidad y calidad técnica que los caracterizaba. Es por eso, que adaptándose a los nuevos códigos compositivos, en el repertorio decorativo que conformaba esos esquemas se pudieron tomar motivos conocidos y familiares en el arte andalusí, no ajenos a los modelos que imperaban en la producción textil del momento.

La unidad cultural del Islam a ambos lados del Mediterráneo y las continuas relaciones comerciales y diplomáticas nos llevan a considerar que los códigos ornamentales de los textiles andalusíes de este periodo están en perfecta sintonía con los repertorio que despliegan las distintas manufacturas islámicas por influencia de las telas que llegaban del centro de Asia, como mostraremos a través de algunos ejemplos significativos. Los marchamos comerciales con que están marcadas algunas piezas ponen en evidencia la importancia del comercio. El gran tejido azul procedente del monasterio de San Zoilo de Carrión de los Condes (Palencia) decorado con águilas bicéfalas explayadas dispuestas en hileras, tiene inscripciones en tres de sus ángulos marcadas con tinta que parecen ser marchamos comerciales [15, p. 196]. Pero más interesante para la tesis que queremos desarrollar es el forro del ataúd de Alfonso de la Cerda procedente del Panteón Real del monasterio de Santa María la Real de Huelgas, donde la decoración se distribuye en franjas horizontales en las que alternan elementos geométricos con bandas epigráficas. En este tejido hay varios marchamos estampados en tinta [16, p. 41, figs. 7-8; 17, p. 228, fig. 6]. Como asegura Herrero, si-

Figura 3. Fragmento de tejido, Lucca, siglo XIV, Metropolitan Museum of Art, Nueva York. Fotografía: Metropolitan Museum of Art, Nueva York (https://www.metmuseum.org/art/collection/search/463599).

guiendo los estudios de Wardwell, se trataría de un *panni tartarici* [18, p. 100]. Con la *pax mongolica* que se establece cuando el imperio mongol domina vastos territorios de Eurasia, el comercio experimenta un gran auge y gracias a este tráfico comercial llegan a los territorios mediterráneos tejidos del Centro de Asia – Transoxiana – conocidos en los inventarios europeos como *panni tartarici*, telas de gran riqueza en sus materiales, con abundante oro, y decoración donde se observa influencia china en muchos de sus motivos y composiciones, así como en aspectos técnicos [18-19]. Estas imitaciones en seda y oro son propias de industrias sofisticadas que interpretaron con creativas variaciones los tejidos centroasiáticos, con lo que se redujo la demanda de estas piezas y se abarató su coste. No obstante, su uso fue exclusivo de los círculos aristocráticos. Es razonable pensar que la potente industria andalusí tuviera que adaptarse a los nuevos gustos para satisfacer a una clientela entre la que estaban los reinos cristianos ibéricos y europeos. En los tejidos peninsulares del siglo XIII abunda el oro en su composición, quizás para emular el fasto de los *panni tartarici* tan demandados por reyes, nobles y dignatarios eclesiásticos. Pero no solamente en los talleres ibéricos se imitaron estas telas importadas que hicieron cambiar los gustos aristocráticos, sino que en las manufacturas italianas también se produjo este proceso de emulación de modelos orientales [20, p. 109], como ponen de manifiesto las telas atribuidas a los talleres de Lucca en el siglo XIV con elementos exóticos y un ritmo sinuoso en la decoración (Figura 3).

En al-Andalus las nuevas modas se van introduciendo desde mediados del siglo XII y si bien los motivos que conforman la decoración de estos tejidos se han interpretado como una evocación al arte andalusí de los siglos anteriores [8, p. 395], como los roleos de la dalmática de Rodrigo Ximénez de Rada (Monasterio de Santa María de Huerta, Soria), que recuerdan los cuerpos tapizados con estos motivos de los bronces califales (Figura 4), parece más bien que este tipo de decoraciones densas, donde los elementos de reducido tamaño contenidos en estructuradas formas geométricas o lobuladas se diseminan sobre la superficie del tejido o se distribuyen en franjas, se extendieron desde Oriente, por tanto no respondería el cambio de decoración a un fenómeno estrictamente local y de carácter ideológico [21, p. 47].

Figura 4. Detalle de la dalmática de Rodrígo Ximénez de Rada, ca. 1274, Monasterio de Santa María de Huerta, Soria.

Los tejidos andalusíes de este periodo son de gran calidad, con una compleja y variada técnica en la que con la seda se combinan hilos metálicos en abundancia en composiciones donde la figuración se minimiza y mimetiza entre el resto de los motivos. Basta citar algunos ejemplos donde se observa esta relación con tejidos de procedencia oriental, como el manto de Fernando, hijo de Alfonso X (Museo de Telas Medievales, monasterio de Santa María la Real de Huelgas, Burgos) [22, pp. 174-175, cat. 20], decorado con medallones cuadrilobulados que encierran cuadrúpedos afrontados a un eje de simetría alternando con esquemas estrellados con motivos vegetales con paralelos en tejidos iranios coetáneos, como un tejido del Victoria and Albert Museum de Londres (inv. T.184-1930) donde los motivos, en este caso exclusivamente animales, se contienen en medallones circulares y poligonales [6, p. 147, fig. 4.16].

En las manufacturas del oriente musulmán se ponen de moda las telas a rayas o *raqm* [23, p. 80] formadas por franjas de distinta anchura y color y que pueden contener motivos variados. De estos tejidos a rayas hay

Figura 5. Fragmento de la dalmática de San Valero, siglo XIII, Metropolitan Museum of Art, Nueva York. Fotografía: Metropolitan Museum of Art, Nueva York (https://www.metmuseum.org/art/collection/search/450727).

excelentes muestras en la colección procedente de los sepulcros del monasterio de Santa María la Real de Huelgas, lo que evidencia que se imitaron en los telares andalusíes, como las ropas de doña Berenguela, el pellote de Leonor de Castilla, la cofia del infante Fernando de Castilla, el forro del ataúd de Fernando de la Cerda, la almohada de Leonor de Castilla, la almohada de María de Almenar [9, pp. 28-29, 48-49, 54-55, 60-61, 91-101], así como en otros tejidos coetáneos como el sudario de doña Mencía de Lara (monasterio de San Andrés del Arroyo, Palencia) y la dalmática de don Rodrigo Ximénez de Rada (monasterio de Santa María de Huerta, Soria) [22, pp. 234-235, 194-197]. La decoración de la almohada de Leonor de Castilla, la cofia del infante don Fernando o una de las bandas de la dalmática de San Valero con fragmentos varios museos, entre otros Metropolitan Museum of Art de Nueva York (Figura 5) o Cleveland Museum of Art (inv. 1928.650) [6, pp. 192-193], formada por cintas que se entrelazan formando estrellas y motivos geométricos, está en relación con la que orna las calzas y el alba del rey de Sicilia Guillermo II (Kunsthistorisches Museum, Viena), con una cronología similar en el segunda mitad del siglo XII o comienzos del siglo XIII [24, pp. 80-83, figs. 1-2], esquemas decorativos que comparten con trabajos en otros materiales, como el minbar de la mezquita Kutubiya de Marrakech (Museo del palacio Badi, Marrakech), en este caso un trabajo cordobés.

En los siglos XIV y XV se mantuvo la influencia oriental a pesar de la aparente originalidad de los textiles ibéricos de este periodo manifestada, fundamentalmente, en la especificidad técnica, como es el caso de la sustitución de los hilos metálicos por seda amarilla, y el uso del color, lo que hace claramente identificable la producción andalusí, si bien un análisis comparativo minucioso permite establecer claras relaciones con textiles de procedencia oriental, fundamentalmente del Egipto mameluco. En este periodo se establecieron estrechas relaciones entre los nazaríes y los mamelucos. Egipto tuvo un papel primordial en la difusión de la cultura porque controlaba todo el comercio entre Oriente y Occidente [7, p. 61]. Los objetos de origen mameluco en al-Andalus ponen en evidencia la red de intercambios que facilitaron la transmisión de tipologías, técnicas y decoración, como ha estudiado Hernández Sánchez en el caso de piezas metálicas a las que atribuye un origen mameluco y presentan composiciones y motivos afines a los de los tejidos contemporáneos [25].

La producción del siglo XIV se configura a partir de los parámetros ya establecidos en la centuria anterior. Se observa la influencia de los tejidos centroasiáticos y mamelucos en los motivos vegetales, como ponen de manifiesto piezas como un tejido del Museo Lázaro Galdiano de Madrid (inv. 1604) (Figura 6) decorado con cuadrifolios incluidos en esquemas circulares y estrellados [26, pp. 70-71] que presenta semejanzas decorativas con textiles como uno de origen egipcio con la inscripción "al-Ashraf" del Victoria and Albert Museum londinense fechado a finales del siglo XIII (inv. 817-1898) [6, p. 256, fig. 7.12], o alguno procedente del ajuar funerario de Rodolfo IV conservado en la iglesia de San Esteban de Viena y datado a finales del siglo XIV [27, p. 237, fig. 7]. La influencia centroasiática es evidente en un tejido decorado con palmetas asimétricas que desarrollan un ritmo sinuoso ascendente entre las que se disponen escudos con el lema de los sultanes nazaríes "gloria a nuestro señor el sultán" (Museo Lázaro Galdiano, Madrid, inv. 1719) (Figura 7) [26, pp. 68-69], inscripción que aporta un sentido dinástico a estas sedas hasta el punto de identificarse toda la producción con la corte nazarí, aunque habría que contemplar la intencionalidad de lanzar a través de estas

Figura 6. Fragmento de tejido, siglo XIV, Museo Lázaro Galdiano, Madrid. Fotografía: Museo Lázaro Galdiano, Madrid.

leyendas epigráficas mensajes legitimadores por parte de un reino en claro declive habida cuenta del uso que de esos tejidos se hacía entre las clases poderosas del reino de Castilla, del que era vasallo. Esta composición ondulante poco difiere de piezas manufacturadas en la otra orilla del Mediterráneo, como un damasco egipcio del Museo del Hermitage de San Petersburgo (inv. EG-905) [6, p. 259, fig. 7.16]. El vínculo entre manufacturas coetáneas dificulta la clasificación de algunos tejidos como andalusíes o de Oriente Próximo, como un fragmento de Abegg-Stiftung en Riggisberg (inv. 3158) decorado con palmetas en ritmo vertical ondulante [28, p. 225, cat. 129], lo que pone de manifiesto la adecuación de los talleres ibéricos a las corrientes decorativas de origen oriental.

En el siglo XV predominan los tejidos listados con franjas de diferente anchura donde se desarrollan esquemas geométricos con predominio de motivos estrellados, lacerías, atauriques e inscripciones epigráficas. De estos tejidos hay numerosos ejemplos, algunos de grandes dimensiones conocidos como cortinas de la Alhambra porque completarían la decoración de las estancias del palacio nazarí complementando la labor minuciosa desarrollada en bóvedas o techumbres, yesería y alicatados coadyuvando a la representación de la creación y su proceso regenerador [29, pp. 223-224; 25, pp. 25-31]. Los tejidos andalusíes listados de los siglos XIV y XV se caracterizan por su rico colorido en rojo, amarillo, blanco y azul con bandas de distinta anchura decoradas con ataurique, motivos geométricos e inscripciones epigráficas donde se repite el lema de la dinastía "gloria a nuestro señor el sultán" o los términos "bendición"

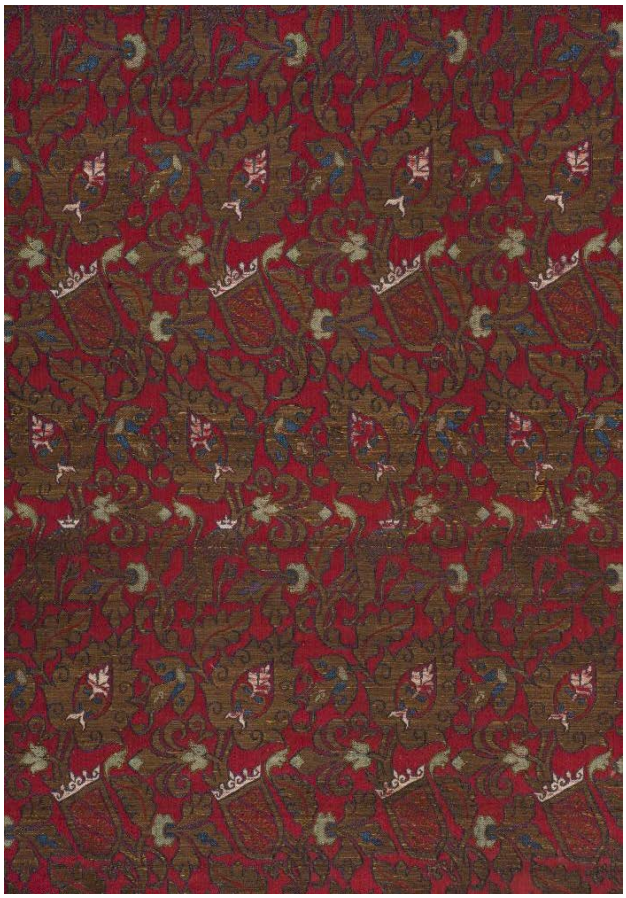


Figura 7. Fragmento de tejido con lema nazarí, siglo XIV, Museo Lázaro Galdiano, Madrid. Fotografía: Museo Lázaro Galdiano, Madrid.

y "felicidad" (Figura 8). Entre los múltiples tejidos de este tipo destacan la capa de los Condestables (Museo Catedralicio, Burgos) [30], con bandas de ataurique y epigráficas con el lema dinástico y el tejido que forraba el ataúd del príncipe Felipe de Castilla (Museo Lázaro Galdiano, Madrid, inv. 1739) (Figura 9) [26, p. 62], pero los tejidos listados no constituyen una creación singular y exclusiva de la producción andalusí, sino una adaptación de los tejidos mongoles y del centro de Asia que se exportaron y utilizaron con distintas funciones en la Europa cristiana en el ámbito civil (vestiduras funerarias de Rodolfo IV, Dommuseum, Viena) [27] y eclesiástico, como los ternos del Diözesanmuseum de Regensburg [31] o los de la iglesia de Santa María en Danzig [32] aunque varían sus códigos cromáticos y ornamentales.

Clasificación cronológica

Los textiles de seda fueron fundamentales en el comercio de exportación, por eso los talleres andalusíes se ajustaron en todo momento a las modas provenientes de Oriente aun manteniendo su particularidad técnica y su personalidad en el repertorio ornamental y los códigos cromáticos. Por tanto, la aparente simplicidad en los diseños que se observa en los tejidos realizados en el periodo que corresponde al reinado de los almohades (1148-1224), no supone un rechazo a los motivos figurativos, que se siguieron manteniendo, en favor de los motivos geométricos tolerados y más afines al rigorismo religioso, sino más bien un cambio de patrones que supuso una adaptación de los talleres andalusíes a los modelos que estaban imponiéndose en los centros textiles orientales y que a su vez coincidieron con un momento muy específico en la concepción del Islam por parte del poder que gobernaba al-Andalus, por eso defendemos mantener una clasificación cronológica, exenta de cargas políticas a la hora de catalogar los textiles [21, p. 46], de esa forma se evitan clasificaciones controvertidas como, a nuestro juicio, la de la capa del infante don Felipe (Museo Arqueológico Nacional, Madrid), que formó parte del ajuar funerario del hermano de Alfonso X el Sabio, enterrado en la iglesia de Santa María la Blanca de Villalcázar de Sirga (Palencia) en 1274. El infante participó en la revuelta nobiliaria de 1272 contra su hermano, el rey, y para eludir las represalias se refugió en Granada invitado por Muhammad I, de donde podría proceder la pieza, decorada con entrelazos, polígonos estrellados, cuadrifolios y atauriques y rematada con bandas epigráficas donde se repite, en caracteres cúficos, *baraka* (bendición). La capa se clasifica como nazarí por el contexto histórico en que, presumiblemente, fue ejecutada [12, pp. 61-62], pero su técnica – se trata de un *taqueté* labrado – y código decorativo no difiere de otros tejidos denominados almohades por tejerse en los años de la decimotercera centuria en los que dicha dinastía reinaba en al-Andalus (Figura 10) [33]. La discriminación por dinastías reinantes no da como

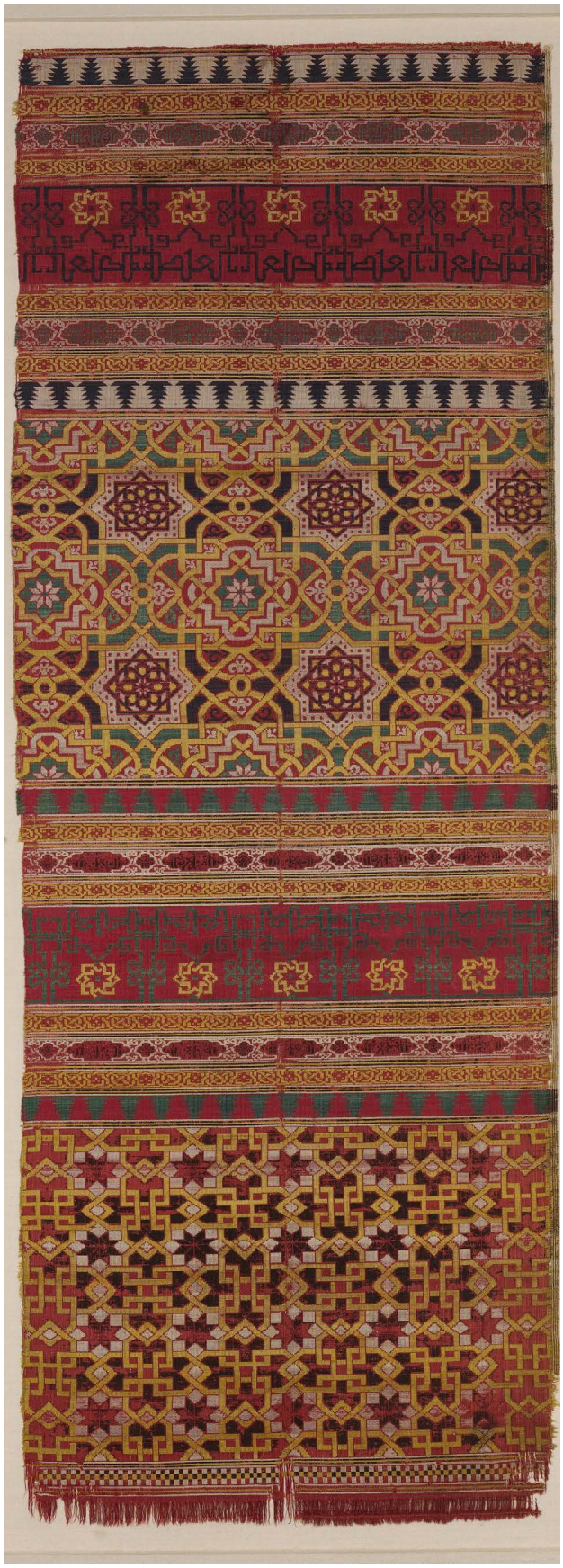


Figura 8. Fragmento de tejido, siglo XIV, Metropolitan Museum of Art, Nueva York. Fotografía: Metropolitan Museum of Art, Nueva York (https://www.metmuseum.org/art/collection/search/448232).

Figura 9. Fragmento del ataúd del infante D. Felipe, ca. 1274, Museo Lázaro Galdiano, Madrid. Fotografía: Museo Lázaro Galdiano, Madrid.

resultado tejidos distintos, por lo que es más adecuada una clasificación cronológica, teniendo en cuenta que en técnica y decoración responde a las producciones del siglo XIII. No parece necesario introducir una clasificación de carácter dinástico entre tejidos que son similares técnica y decorativamente en función de su cronología, es más, pensamos que precisamente la cronología nos permite comprobar la continuidad de modas más allá del devenir político.

Conclusión

Este estudio preliminar pretende plantear un nuevo enfoque en la consideración de los últimos siglos de producción textil andalusí, a la que se ha atribuido historiográficamente una singularidad que es matizable si tenemos en cuenta que un análisis comparativo con piezas atribuidas a distintas manufacturas del mundo islámico y oriental, que se tiene que ir estableciendo de manera sistemática, muestran como los repertorios y códigos compositivos y decorativos siguieron llegando a al-Andalus entre los siglos XII y XV favoreciendo que sus productos fuesen adquiridos por una amplia clientela asignándolos distintas funciones. Los tejidos de seda actuaron como los mediadores primarios en el intercambio cultural debido a su portabilidad y alto estatus. Con estos objetos de gran lujo los estilos y motivos cruzaron fronteras culturales, así como las innovaciones tecnológicas que dieron lugar a piezas de gran sofisticación donde los elementos foráneos se adaptaron a los gustos y particularidades de los centros de producción, como fue el caso de los talleres andalusíes de los últimos siglos medievales.

Agradecimientos

Este artículo está integrado en el Proyecto de Investigación I+D+i HAR2014-54918-P, "Las manufacturas textiles andalusíes: caracterización y estudio interdisciplinar" financiado por el Ministerio de Economía y Competitividad del Gobierno de España.

ORCID

Laura Rodríguez Peinado
https://orcid.org/0000-0002-5957-4442

Referencias

1 Rodríguez Peinado, L., 'La producción textil en al-Andalus: origen y desarrollo', *Anales de Historia del Arte* **22** (2012) 265-279, https://doi.org/10.5209/rev_anha.2013.v23.41572.

2 Rodríguez Peinado, L., 'La seda en la Antigüedad Tardía y al-Andalus', in *Las rutas de la seda en la historia de España y Portugal*, ed. R. Franch Benavent & G. Navarro Espinach, Publicacions de la Universitat de València, Valencia (2017) 15-38.

3 Molina López, E.; Álvarez de Morales, C., `Repertorio de noticias geográficas sobre Almería islámica', in *Homenaje a la profesora Elena Pezzi*, ed. A. Escobedo Rodríguez, Universidad de Granada, Granada (1993) 77-86.

4 Serjeant, R., *Islamic Textiles. Material for a History up the Mongol Conquest*, Intl. Book Center, Beirut (1972).

5 Partearroyo Lacaba C., 'Tejidos almorávides y almohades', in *Al-Andalus, las Artes Islámicas en España*, ed. J. Dodds, El Viso, Madrid (1992) 105-114.

6 Mackie, L. W., *Symbols of Power. Luxury textiles from Islamic lands, 7th-21th Century*, New Haven – Londres, The Cleveland Museum of Art (2015).

7 Rosser-Owen, M., *Arte Islámico de España*, Fundación Tres Culturas – Turner, Sevilla (2010).

8 Partearroyo Lacaba, C., 'Tejidos andalusíes', *Artigrama: Revista del Departamento de Historia del Arte de la Universidad de Zaragoza* **22** (2007) 371-419.

9 Herrero Carretero, C., *Museo de Telas Medievales. Monasterio de Santa María la Real de Huelgas*. Patrimonio Nacional, Madrid (1988).

10 Jacoby, D., 'Silk economics and cross-cultural artistic interaction: Byzantium, the Muslim World, and the Christian West', *Dumbarton Oaks Papers* **58** (2004) 198-240, https://doi.org/10.2307/3591386.

11 Partearroyo Lacaba C., 'Los tejidos de al-Andalus entre los siglos IX al XV (y su prolongación en el siglo XVI)', in *España y Portugal en las Rutas de la Seda. Diez Siglos de Producción y Comercio Entre Oriente y Occidente*, Comisión Española de la Ruta de la Seda, Universitat de Barcelona, Barcelona (1996) 58-73.

12 Partearroyo Lacaba C., 'Estudio histórico-artístico de los tejidos de al-Andalus y afines', *Bienes Culturales: Revista del Instituto del Patrimonio Histórico Español* **5** (2005) 371-420.

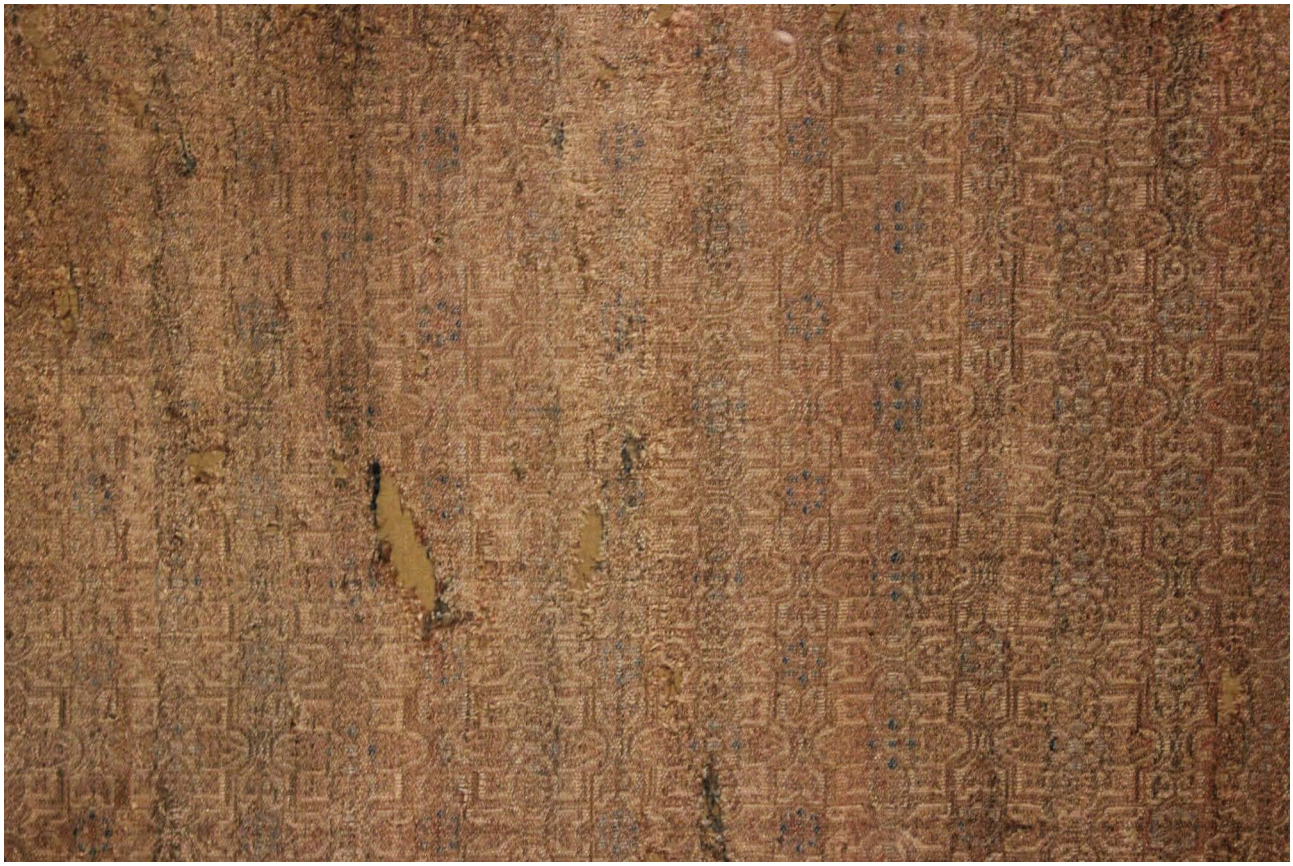


Figura 10. Fragmento de la capa del infante D. Felipe, ca. 1274, Museo Arqueológico Nacional, Madrid. Fotografía: Miguel Hermoso Cuesta (https://commons.wikimedia.org/wiki/File:Capa_del_infante_don_Felipe_02.JPG).

13 Goitein, S., *A Mediterranean society. The Jewish communities of the Arab World as Portrayed in the Documents of the Cairo Geniza*, University of California Press, Berkeley - Los Angeles (1967).

14 Cameron, A., *El Mundo Mediterráneo en la Antigüedad Tardia (395-600)*, Crítica, Barcelona (1998).

15 Rodríguez Peinado, L., 'Los textiles como objetos de lujo y de intercambio', in *Las Artes en Al-Andalus y Egipto. Contextos e Intercambios*, ed. S. Calvo Capilla, La Ergástula, Madrid (2017) 187-206.

16 Herrero Carretero, C., 'Marques d'importation au XIV^{e} siècle sur les tissus orientaux de Las Huelgas', *Bulletin du CIETA* **81** (2004) 40-47.

17 Böse, K., 'Beyond foreign: textiles from the Castilian royal tombs in Santa María de Las Huelgas in Burgos', in *Oriental Silks in Medieval Europe*, eds. J. von Firks & R. Schorta, Abegg-Stiftung, Riggisberg (2016) 213-230.

18 Wardwell, A., *Panni Tartarici: Eastern Islamic Silks Woven with Gold and Silver (13Th and 14Th Centuries)*, Bruschettini Foundation for Islamic and Asian Art, New York (1989).

19 Wardwell, A., 'Flight of the Phoenix: crosscurrents in late thirteenth- to fourteenth-century silk patterns and motifs', *Bulletin of the Cleveland Museum of Art* **74** (1987) 2-35.

20 Jacoby, D., 'Oriental silks at the time of the Mongols: patterns of trade and distribution in the West', in *Oriental Silks in Medieval Europe*, eds. J. von Firks & R. Schorta, Abegg-Stiftung, Riggisberg (2016) 92-123.

21 Feliciano, M. J., 'Medieval textiles in Iberia: studies for a new approach', in *Envisioning Islamic Art and Architecture. Essays in Honor of Renata Holod*, eds. D. J. Roxburgh, Brill, Leiden – Boston (2014) 46-65, https://doi.org/10.1163/9789004280281_004.

22 Yarza, J., *Vestiduras Ricas. el Monasterio de las Huelgas y Su Época, 1170-1340*, Patrimonio Nacional, Madrid (2005).

23 Saladrigas Cheng, S., 'Los tejidos en Al-Andalus: siglos IX – XVI. Aproximación técnica', in *España y Portugal en las Rutas de la Seda. Diez Siglos de Producción y Comercio Entre Oriente y Occidente*, Comisión Española de la Ruta de la Seda, Universitat de Barcelona, Barcelona (1996) 74-98.

24 Dolezalek, I., 'Comparing forms, contextualising functions: Arabic inscriptions on textiles of the Norman king William II and Fatimid tiraz', in *Oriental Silks in Medieval Europe*, ed. J. von Firks & R. Schorta, Abegg-Stiftung, Riggisberg (2016) 80-91.

25 Hernández Sánchez, F., 'Dos nuevas piezas metálicas mamelucas de la colección del Instituto Valencia de don Juan', in *Las Artes en Al-Andalus y Egipto. Contextos e Intercambios*, ed. S. Calvo Capilla, La Ergástula, Madrid (2017) 131-144.

26 López Redondo, A., Marinetto Sánchez, P., *A la Luz de la Seda. Catálogo de la Colección de Tejidos Nazaríes del Museo Lázaro Galdiano y el Museo de la Alhambra. Orígenes y pervivencias*, TF Editores, Madrid (2012).

27 Ritter, M., 'Cloth of gold from West Asia in a late medieval European context: the Abu Sa'id textile in Vienna – Princely funeral, and cultural transfer', in *Oriental Silks in Medieval Europe*, eds. J. von Firks & R. Schorta, Abegg-Stiftung, Riggisberg (2016) 231-251.

28 Otavsky, K., Salim, M. A. M., *Mittelalterliche Textilien I.* Ägypten*, Persien und Mesopotamien, Spanien und Nordafrika*, Abegg-Stiftung, Riggisberg (1995).

29 Ruiz Souza, J. C., 'Egipto, Granada y Castilla: estrategias y convergencias en la arquitectura del poder', in *Las Artes en Al-Andalus y Egipto. Contextos e Intercambios*, ed. S. Calvo Capilla, La Ergástula, Madrid (2017) 207-232.

30 Moreno García, M., Platero Otsoa, A., 'Gloria al sultán en la capa de los condestables de la catedral de Burgos', *Akobe: Conservación y Restauración de Bienes Culturales* **8** (2007) 36-43.

31 Von Fircks, J., 'Islamic striped brocades in Europe: "Heinrichsgewänder" in Regensburg from a transcultural perspective', in *Oriental Silks in Medieval Europe*, eds. J. von Firks & R. Schorta, Abegg-Stiftung, Riggisberg (2016) 266-287.

32 Borkopp-Restle, B., 'Striped golden brocades with Arabic inscriptions in the textile treasure of St. Mary's church in Danzig/Gdansk', in *Oriental Silks in Medieval Europe*, eds. J. von Firks & R. Schorta, Abegg-Stiftung, Riggisberg (2016) 288-299.

33 De los Santos Rodríguez, R. M.; Suárez Smith, C., 'Informe técnico sobre los trabajos de conservación y restauración de la capa del infante don Felipe (siglo XIII), *Boletín del Museo Arqueológico Nacional* **15** (1997) 231-239.

Recibido: 2018-6-17
Revisto: 2018-11-7
Aceptado: 2018-12-5
Online: 2019-2-4

Estudos sobre têxteis históricos
Studies in historical textiles
A. Serrano, M. J. Ferreira, E. C. de Groot (ed.)

Artículo / Artigo / Article

El quimono en la Nueva España: una manifestación local de una moda global en los siglos XVII-XVIII

Andreia Martins Torres

CHAM – Centro de Humanidades (NOVA FCSH-UAÇ), Avenida de Berna, 26-C, 1069-061 Lisboa, Portugal
andreiamtorres@gmail.com

Resumen

Este trabajo se centra en el quimono para destacar como la cultura material japonesa participó en el desarrollo de un gusto de inspiración asiática en la Nueva España. A partir de esta idea demuestra que esas piezas contribuyeron a la emergencia de un código achinado en la moda del siglo XVII y que se consolidó durante la centuria siguiente. La adopción de una perspectiva de la historia conectada, así como el recurso a fuentes escritas y pictóricas, han permitido identificar su papel pionero en esa tendencia así como en su difusión americana. Del mismo modo, se reconocieron las miradas cruzadas entre Asia, Europa y América para resignificar y readaptar esa prenda hasta transformarla en una bata.

Palabras clave
Moda
Textiles
Japón
Nueva España
Quimono

O quimono na Nova Espanha: uma manifestação local de uma moda global nos séculos XVII-XVIII

Resumo

Este trabalho centra-se na análise do quimono para destacar o papel da cultura material japonesa para o desenvolvimento de um gosto de inspiração asiática na Nova Espanha. A partir desta ideia, demonstra-se que essas peças contribuíram para o aparecimento de um código *achinado* na moda do século XVII, que se consolidou durante o século seguinte. A adopção de uma perspectiva de história conectada, assim como o recurso a fontes escritas e pictóricas, permitiram identificar o seu papel pioneiro nessa tendência e na sua difusão americana. Do mesmo modo, reconhecem-se os olhares cruzados entre a Ásia, a Europa e a América para ressignificar e readaptar essa roupa, até transformá-la numa bata.

Palavras-chave
Têxteis
Japão
Nova Espanha
Quimono
Quimão
Timão

ISSN 2182-9942

Conservar Património **31** (2019) 79-95 | https://doi.org/10.14568/cp2018008
ARP - Associação Profissional de Conservadores-Restauradores de Portugal
http://revista.arp.org.pt

The kimono in New Spain: a local manifestation of a global fashion in the 17th and 18th centuries

Abstract

This paper examines the kimono to emphasize the role of Japanese material culture in the development of an Asian-inspired taste in fashion of New Spain. From that idea, it shows that some Nipponese products contributed to the occurrence of an *achinado* code in dress since the seventeenth century, and that was consolidated during the following century. The adoption of a connected history perspective, as well as the use of written and pictorial documents, allowed us to identify its pioneering role in that tendency as well as in its American diffusion. At the same time, we recognized the intersected points of view between Asia, Europe and America to adapt and change the meaning of that garment, until it becomes a dressing gown.

Keywords

Fashion
Textiles
Japan
New Spain
Kimono
Japanese robe

La *japonización novohispana* a través de sus ropas

El interés por las mercancías que llegaban por el Pacífico motivó estudios sobre su impacto económico y social en el imperio español, sin que los objetos japoneses y sus textiles merecieran una reflexión particular. Los trabajos de David Almazán [1], Dennis Carr [2], Fernando García [3], Víctor Mínguez e Inmaculada Rodríguez [4], Oliver Turner Ivey [5] y Mayuyama Junkichi [6] han contribuido a un mejor conocimiento del arte nipón y sus adaptaciones en el mundo hispano. Frecuentemente éstas se asocian a las porcelanas, o a las técnicas de enconchado y laca que ilustran la influencia asiática en diferentes exposiciones [7-8]. Las piezas con ese acabado se designaban con el adjetivo *japonés* cuando eran importadas, y hechas *al remedo de Japón* si se trataban de imitaciones. De eso se infiere que tuvieron una identidad diferenciada entre las aportaciones asiáticas a la cultura material novohispana, pero no fueron un ejemplo aislado.

Hubo casos en que la conexión pervivió en el lenguaje, empleándose un término derivado del japonés para referirse a los muebles originalmente importados de ahí, como el biombo [9-11]. Menos trabajadas son las ropas, que sirvieron a sus usuarios para imaginar a *otros* y recrearse a partir del propio cuerpo, dando consistencia a un nuevo lenguaje estético y simbólico que se manifestaba en la producción de escenarios *achinados*, expresión utilizada en Nueva España para referirse genéricamente a los objetos hechos en Asia y a sus imitaciones [12-15]. Entre éstos se incluyeron unas prendas interpretadas como batas, designadas de quimón(es) y quimono(s), que se emplearon desde inicios del siglo XVII hasta las primeras décadas del siglo XIX [16-17].

Ambas voces identificadas derivan del japonés *kimono (着物)*, formado por la palabra *mono,* cosa, y *ki,* que proviene de *kiru*, vestir, llevar puesto. Se trataba de una prenda de formas anchas y largas que evolucionó del *kosode* para adquirir un significado especial, vinculado a cuestiones políticas y culturales internas [18-21]. Los ejemplares más refinados se hacían con los tejidos importados de Persia e India, que llegaban en cantidades reducidas y conferían prestigio a quien los ostentaba. A esa transformación cultural Kayoko Fujita [22] designó de *indianización de Japón* y, con algunos resalvos, fue la misma que sucedió en Europa y América ante la llegada de los textiles asiáticos. Cabe entonces descifrar su contribución a la *japonización novohispana*.

Al trasladarse el vestido de su contexto original para transformarlo en una mercancía dentro del imperio español, éste se sometió a un proceso de resignificación que le otorgó nuevas formas y sentidos en sus versiones castellanas. Durante todo el período virreinal ambos términos sirvieron para referirse a un tejido de algodón muy fino, pintado y estampado, del tamaño de ocho varas, y a ciertas batas de corte asiático que estaban confeccionadas con una pieza de cualquier textil con esas dimensiones, independientemente de que su origen fuese japonés o no [16-17].

Un ejemplo muy claro de lo que se acaba de afirmar es el relato sobre la intervención de Nicolás de Labayán, nativo de la provincia de Ilocos y al servicio de la Corona como alférez de Manila durante el levantamiento de los *sangleyes,* en mayo de 1686. En el informe se dice que él salió a la calle cubierto sólo con un *quimono* sobre su ropa interior [23]. Pero, si se trataba de un nativo, lo más probable es que su traje no tuviera un origen japonesa sino que fuera la prenda tradicional de la región y que, por sus características, se pudo interpretar como otro tipo de bata. Por eso se defiende la tesis de que este hombre mantendría sus costumbres ancestrales pese a haber accedido a cargos de la administración española. En ese contexto, el término quimono se emplearía así para referirse a las *batas* de los *xapones* del barrio de Binondo, las de *sangleyes* confinados al barrio de Tondo y al Parián de Manila, pero igualmente

a las de los filipinos, producidas con textiles de fibra de plátano, de piña, de algodón, seda, o *abacá*.

Aunque en el mundo hispano se consideraba que los mejores quimonos venían de Japón, en lo que concierne a su acepción como prenda, la palabra se empleó para designar genéricamente cualquier ropa tipo bata de corte asiático. En suma, en el lenguaje castellano todos esos modelos remitían a un imaginario sobre la cultura nipona que incluía objetos hechos en otras partes, tal como sucedía con el biombo. Del mismo modo, es posible pensar que las demás prendas asiáticas en forma de *T*, que aparecen en menor medida en la documentación, se incluirían en el concepto de quimono.

Varios investigadores señalaron la circulación de estas piezas a través del Galeón de Manila, sin adentrarse en el tema. Ese no fue el caso de Berenice Ballesteros [24] quien se refiere a estas ropas al reflexionar sobre los *achinados* y los *japones* en las apropiaciones novohispanas de los bienes asiáticos. Su investigación tuvo el gran mérito de distinguir una demanda específica de materiales japoneses que mantuvieron una identidad diferenciada en el ideario local. Entre éstos incluyó los quimonos, pero consideró su uso excepcional y como resultado de una fuerte demanda de productos de esta región que obligó a los japoneses a "echar mano de objetos destinados al consumo local", totalmente "ajenos a las costumbres occidentales". Como se demostrará, tales afirmaciones son bastante controvertidas. En primer lugar, la autora no distingue la tela de la prenda en la documentación, designando ambas por *kimonos*. Aunque señale las dos palabras en el glosario al final del artículo, no refiere que la diferenciación ortográfica es anacrónica y que las fuentes revelan una realidad bastante más compleja. Tampoco reconoce el impacto de la bata en la indumentaria novohispana e ignora su consumo en occidente, donde se produjeron adaptadas formal y simbólicamente a las prescripciones locales.

Las lagunas identificadas son comunes a otros trabajos enfocados en el arte o en la economía y resultan de la poca comunicación entre las diferentes especialidades, sobre todo con la historia de la indumentaria, que sólo en los últimos años se afirmó como un campo de estudio con metodologías propias. Desde esa disciplina se hicieron varias aportaciones al tema que deben considerarse.

Julieta Pérez Monroy [25] se interesó por el vestuario como uno de los aspectos de la vida cotidiana del siglo XIX y se deparó con la gran divulgación de las batas en las formas de estar y ataviarse en casa, aludiendo a la costumbre de las élites de vestir chaquetas y batas en ambiente familiar. Asimismo nada dice del quimono.

Hubo casos en que las investigaciones se centraron en la literatura para descifrar percepciones acerca de la ropa en Nueva España. María del Carmen Arechavala [26] distinguió las visiones femeninas y masculinas en los grabados de Claudio Linati, donde el autor trató de plasmar los trajes civiles, militares y religiosos mexicanos en una obra impresa por primera vez en 1828. Su objetivo fue asociar esas impresiones pictográficas con los relatos literarios contemporáneos de dos autores. En primer lugar, analizó el diario de la escocesa Madame Calderón de la Barca, esposa del primer embajador de España en México, escrito durante su breve estancia (1839-1842) en el país recientemente independizado. En segundo lugar, se centró en el texto de Manuel Payno (1810-1894), un político y periodista mexicano que escribió varias novelas ambientadas en el período de transición entre el virreinato y la república independiente. La propuesta de Arechavala asoció los dos tipos de registro artístico para interpretar cuestiones relacionadas con la moda, como esta prenda. No obstante, no llegó a discernir que, hasta el siglo XX, las designaciones de quimón y quimono incluyeron tejidos de algodón pintado y estampado como también batas de corte asiático. La tesis de María de los Ángeles Navarrete [27] dio un giro hacia las cuestiones lingüísticas para percibir la historia de los atuendos a través de la etimología y puntualizó algunas cuestiones relacionados con la prenda.

La mayor contribución para el entendimiento del quimono en el virreinato se encuentra en la tesis doctoral de Guillermina Solé Peñalosa [28]. La investigación se centra exclusivamente en el siglo XVII, distinguiendo el vestuario de hombres y mujeres. En el apartado sobre la casa y la ropa de levantar dedica algunas páginas al quimono. La autora entiende su adopción como una evolución de otros modelos de bata anteriores, a los que se reacomodó, pero también como resultado del establecimiento de nuevos usos para las prendas asiáticas y es esa también la idea que aquí se desarrollará. Más allá de las elecciones textiles que identificó en la documentación, no pudo localizar un registro gráfico que le permitiese hacer más consideraciones acerca del aspecto que tuvieron. Sin embargo, sí las reconoció en los cuadros de castas del siglo posterior, asociando esa moda a las tendencias europeas, sin tener en cuenta el vínculo simbólico con Asia que nunca perdió.

Los importantes esfuerzos por determinar las características particulares de la indumentaria novohispana han creado las bases para futuras discusiones. Los intentos de puntualizar el significado del quimono no trazaron su evolución formal ni el papel que cumplió en las dinámicas de ostentación y diferenciación social a lo largo del período colonial. En artículos dedicados al estudio de los quimonos, se llega a puntualizar sobre algunos procesos internos de resignificación de la prenda y se hizo un tímido intento de relacionarlo con dinámicas más amplias [16-17]. No obstante, los textos se centran fundamentalmente en las relaciones comerciales y no se llega a reconstituir su evolución simbólica o formal. Tampoco se discurre sobre el significado de la identificación en la iconografía virreinal de modelos similares a los de Europa. Este aspecto es especialmente relevante puesto que esta tendencia incluyó prácticamente todo el mundo occidental. En el virreinato, su origen o influencia fue marcadamente japonesa, conformando un mercado diferente pero inserto en el comercio más amplio de objetos asiáticos. A pesar de todo, las historiografías europea y norteamerica-

na vienen perpetuando una visión circunscrita de la presencia americana de batas de corte asiático, sin considerar las particularidades de los territorios hispanos [29-38]. Es precisamente eso que se contraria al recoger la información ya publicada sobre el tema en diferentes países, analizando los registros escritos e iconográficos del quimono en distintas regiones para destacar las singularidades de esta tendencia en el virreinato y sus conexiones con lo que sucedía en el resto del mundo.

Habrá entonces que entender de qué forma se descontextualizaron, en Nueva España, los materiales producidos en Asia por *otros* y se usaron ahí bajo nuevas premisas, de manera paralela a lo que sucedía en Europa. Para el efecto se adopta un enfoque de la historia cultural, específicamente de la cultura material y su circulación a partir de redes mercantiles. Eso permitirá destacar cómo las modas europeas y americanas dialogaron entre sí y con sus referentes asiáticos, para reconocer funcionalidades y significados a una bata que venía, o se inspiraba, en un vestido *oriental*. Así se pone de relieve el protagonismo del virreinato, su papel en la expansión de batas designadas de quimono en América y los aspectos sociales que contribuyeron a la construcción y evolución de su significado.

En suma, el vestuario estuvo sometido a diferentes influjos externos que se sumaron a una realidad interna bastante compleja y desigual, formando un trampantojo cultural en el que se perciben elementos de distinta naturaleza. Estos se conjugaron particularmente en el quimono: una prenda asiática y nombrada con un vocablo de origen japonés, que respondía a las necesidades de un modo de vida y a unas costumbres europeas que se aplicaban en América con algunas adaptaciones. Lo que se defiende es que el quimono, al igual que otras piezas de origen japonesa, participó en la formación de un código *achinado* en la moda, implicando transferencias simbólicas y formales que unieron los tres continentes.

La moda de las batas asiáticas en Occidente: nuevas aportaciones

La introducción del quimono en Nueva España ocurrió en el siglo XVII acompañando una tendencia mundial. La manera de designarlo en Europa lo asoció a un origen asiático o medioriental, en función de las vías por las que se adquiría. En castellano se asoció a Japón pero, independientemente del idioma, se le conoció vulgarmente como bata, porque así se fue incorporando a las diferentes modas europeas. Dicho fenómeno motivó algunos trabajos, especialmente en Francia, Inglaterra y Holanda, en los que se interpretó como el resultado de sus actividades expansionistas y de la formación de compañías comerciales con Asia. De manera consensual se atribuye a los holandeses el papel de precursores de esa costumbre en occidente, a partir de 1630-1640, sin que se tuviera en cuenta los espacios dominados por las potencias ibéricas [29].

Cabe destacar que la primera referencia conocida a un quimono de Japón en Europa es precisamente entre los bienes de un portugués, durante el período de la Unión Ibérica. Se trata de Garcia de Melo e Torres, quien desempeñó importantes cargos en la administración de los espacios ultramarinos portugueses, ya fuera como capitán de la factoría de Sofala (Mozambique) o como veedor de la hacienda del *Estado da India*. Al fallecer, en Madrid, se hizo el inventario de sus bienes el día 31 de octubre de 1631 y, entre los géneros arrollados, constaba "um quimão do Japão forrado de tafeta azul celeste que é de couro empenssado", evaluado en mil reales. Se encontraba junto a otros objetos asiáticos tales como "2 beiramos dourados do Japão de 4 quadros cada um avaliado em 20.000 reais", "2 boyombos mais pequenos de china de 20.000 reais", "uma gaveta do japão de couro negro de 2.000 reais" y "2 catanas de japão uma maior que a outra com sua guarnição de prata de 3.000 reais", demostrando un gusto por esas piezas [39]. Asimismo persisten algunas dudas de que se trataba realmente de un *kimono*, ya que hasta ahora no se conoce ningún ejemplar en cuero. Más bien parece que la incorporación de la palabra al vocabulario portugués sufrió el mismo proceso que en castellano, aplicándose a otras prendas de origen asiático que recordaban ligeramente a una bata. En todo caso, la ostentación de este ejemplar por parte del portugués y en fechas tan tempranas es bastante reveladora, sugiriéndose la posibilidad de que fuera adquirido durante su estancia en la India. Peter Mundy llegó a Macao en 1637, tan sólo unos años después que se hiciera el referido inventario, dejándonos una excelente descripción de las rutas de comercio mediante las cuales se cargaba la Nao Negra, "después que el comercio con Japón estuviera lanzado". Ésta salía de Goa con destino a Malaca, donde su carga inicial se cambiaba por otras mercancías para seguir de nuevo en dirección a Macao, ciudad donde se quedaba entre 10 a 11 meses para poder acceder a las ventas semestrales de seda de Cantón. Este producto llegaba en pequeños barcos y constituía el principal elemento del comercio con Japón. Aparentemente, las únicas mercancías exportadas desde el archipiélago nipón eran plata y curiosidades tales como armarios de laca, cajas de muebles, biombos pintados, espadas, lanzas y *kimonos* [40].

Paralelamente se han detectado evidencias del uso del "quimão" en cortejos religiosos celebrados en las ciudades portuguesas de la Península Ibérica. En esos casos, su función era la de fantasía, para representar a personajes de China, India y Japón [41], aunque los portugueses que residían en esos parajes asiáticos usaran la prenda como parte de su vestuario. Eso es lo que observa Peter Mundy al ser recibido en la casa del gobernador de Macao, Antonio de Oliveira Aranha, quien actuara como capitán-mor del viaje a Japón. En esa ocasión, el autor describe las ropas de las hijas pequeñas de su anfitrión, cuyos "trajes exteriores eran pequeños kimonos o abrigos japoneses" [40]. Cabe aún referir que la primera embajada japonesa enviada a Europa fue recibida por la Corte de los Bragança, en Vila

Viçosa, a septiembre de 1584. El aspecto de esas personas sería muy distinto al de cualquier otra que habrían visto antes, provocando el interés de Doña Catarina de Bragança, quien ordenó sacar el molde de sus trajes, entre los que seguramente se incluyeron *kimonos* [42].

La posición pionera de las potencias ibéricas contrasta con su invisibilidad en las reflexiones sobre la propagación de cortes de bata asiáticos y en la construcción del complejo valor simbólico que alcanzaron en el exterior, existiendo apenas referencias puntuales en trabajos dedicados a otras temáticas [43-44]. Por eso, con excepción de EEUU, donde se estudiaron como un rasgo de la influencia británica durante el siglo XVIII [30-31, 45], poco se sabe sobre el quimono en Brasil (llamado "timão") [46] o en los virreinatos españoles.

Contrariando esa imagen, las investigaciones sobre México revelaron indicios de la presencia del atuendo en período temprano en el contexto global de su difusión, destacando la importancia de seguir profundizando sobre el tema en otras regiones del continente. La primera pieza identificada en Nueva España es anterior a 1622, cuando se inventariaron los bienes del capitán Andrés de Acosta recuperados en el naufragio de la almiranta N.ª S.ª de Atocha, que iba de Manila a Acapulco y se hundió en Florida. Este hombre, mantenía fuertes vínculos al comercio de Filipinas, a sus vecinos y autoridades eclesiásticas, como se comprueba por la referencia a varios objetos a nombre de otras personas como de "Manuel Pastrana, vecino de Manila", o del "canónigo de Manila". Entre sus ropas constaba "un quilmon de china" guardado en una "caja grande de china", donde posiblemente se trasportara en el galeón, como era práctica en relación a los textiles más delicados [40]. No se sabe si el autor del documento empleó la palabra "chino" como sinónimo de asiático pero aparecen varios muebles de Japón como baúles y bufetillos, escritorillos que nos permiten cuestionarlo. Además de la referencia a quimonos, se detectó una "turca [bata] de raxa verde con passamanos de oro y un papel dentro que dice es de Cathalina de Quiñones y deven veinte pessos", posiblemente un encargo que le hizo.

La prenda era aún una curiosidad y quizás nunca se llegara a utilizar, puesto que no se describen señas de desgaste. No obstante, el testimonio es un poco anterior a las primeras noticias de su aparición en Europa, lo que pone en cuestión que fuera desde ahí que se extendiera hacia América o que su simbolismo se forjara en el Viejo Mundo, como hasta ahora se viene defendiendo. Como mínimo se podría decir que esos fenómenos fueron simultáneos.

Aparentemente, las raíces de esa tendencia se encuentran en Asia, donde los ibéricos los vistieron mucho antes que los holandeses. La referencia más antigua de su uso como bata se registra precisamente en Macao, por parte de la portuguesa Leonor de Fonseca. A 17 de noviembre de 1593, ella es acusada de "beijar mais tambem humas figuras douradas porcos &c. que estauam pintadas em hum quimão de Japão que trazia vestido" [47]. La necesidad de adecuar la indumentaria al clima hizo que se inspiraran en los materiales y ropas de la zona para adaptarse al nuevo entorno. Hasta donde se averiguó, eso no correspondió a un intento de integración en el que trataran de parecerse a los nativos. Para ellos, dichos modelos recordaban a la *ropa turca* de la metrópolis, sumándose luego a otros tipos de *ropa española de levantar* que desde mediados del siglo XVI se empleaba en ambiente familiar, además de usarse como abrigo de niñas [40].

Este cuadro de absorción de lo ajeno consistió en una *domesticación de lo exótico*, que partió de una esteriotipización del *otro* y de la apropiación de ciertos elementos ajenos para interpretarlos dentro de pautas culturales propias. Más allá del debate sobre las dinámicas de dominio subyacentes a esta tendencia, o sobre la dialéctica entre lo propio y lo ajeno, el término ha sido empleado por diversos investigadores para estudiar la historia de los textiles y de la moda, entre los cuales cabe destacar a Maxine Berg [15]. Desde el punto de vista estrictamente europeo, el proceso supuso la apropiación de unas ropas empleadas originalmente por *otros* para transformarlas funcional y alegóricamente bajo el referente español, el de la bata turca, o sea "vestido grosero y suelto" [48]. Eso se materializó en su transferencia desde el espacio exterior para el interior y que del ámbito público pasara al privado e íntimo. En esa condición, ya no de *kimono* sino de *bata de quimono*, se exportó a otras partes del Imperio.

Los estrechos lazos entre Manila y Acapulco posibilitaron su incorporación prematura entre la población novohispana. Mientras tanto, los comerciantes del virreinato las hacían llegar a la península, de manera indirecta y a través de la práctica corriente del regalo. Así los enviaban a familiares y altos funcionarios que intercedían por ellos, o incluso al monarca. También en este aspecto el ejemplo del capitán Acosta es paradigmático ya que, poco tiempo antes de su muerte, dejaría preparado un "caxoncillo cerrado de china yntitulado para don francisco ariaz de Verastegui mi hermano que el d[ic]ho albacea dixo averlo ynviado de china p[ar]a castilla don Juan Claudio" [49]. En su interior, seleccionó varios materiales demostrativos de las curiosidades de Asia, como una cajita de concha, unas bolas de marfil, algunos tejidos y, como no, "un quilmon". Eso, a pesar de que Rodrigo de Vivero, gobernador de Filipinas que a su regreso a Nueva España naufragó en Japón y fue recibido directamente por el shogun (1609-1610), llegara a afirmar que los géneros nipones, por ordinarios, no eran necesarios en la Nueva España. Las palabras de Sebastián Vizcaíno, el primer embajador español en Japón que recibió su nombramiento en 1611, reproducen esa misma idea, atribuyendo la falta de éxito de las mercancías europeas llevadas como regalo, a que sus habitantes estuvieran "enseñados a quimones y otras cosas de poco valor" [50-51].

Aunque es prácticamente imposible determinar donde el quimono empezó a constituir una tendencia visible en la moda, la referencia más antigua a su incorporación al

ajuar de occidentales es en Macao y en Manila. Fuera de Asia todo indica que el primer lugar lo ocuparía Nueva España, la principal puerta de entrada a los productos asiáticos en el Imperio Español. Es cierto que la Península estuvo sometida a los influjos que llegaban desde Asia a través del virreinato e igualmente desde otras potencias europeas, cuyos naturales mantenían estrechas relaciones con sus ciudades portuarias. Sin embargo, los diversos trabajos que se dedicaron a la cultura material asiática o al *kimono* sugieren que su uso no fue tan expresivo [52-53].

Lo más probable es que, entre 1630 e inicios de la centuria posterior, las potencias europeas adoptaran progresivamente diferentes modelos de batas asiáticas en las regiones bajo sus dominios, incluso en el Viejo Mundo. Cada uno de esos territorios tuvo su propio proceso de reconocimiento de la prenda, pero la nueva coyuntura política y comercial creó las bases para un dialogo permanente entre las distintas realidades culturales puestas en contacto, que se retroalimentarían en la manera de vestir y significar el quimono. Nueva España no quedó exenta de ese proceso pues recibió las prendas desde época temprana e incluso fue plataforma para remitirla a otros espacios americanos y metropolitanos.

El papel de la Nueva España en la difusión de modelos de bata asiáticas en América

El quimono fue una de las varias prendas asiáticas que alcanzaron difundirse en occidente pero su estudio cuenta con varios problemas. La documentación generada por diferentes instituciones a lo largo del período virreinal no siempre indica el origen o tipo de pieza a que se refiere y no se encontró una imagen gráfica adicional que pudiera tomarse como referencia del aspecto de cada modelo señalado en los textos. Tampoco se conserva ningún ejemplar en México ya que el supuesto *kimono* custodiado por el Museo Histórico de Acapulco está descontextualizado (n.º inv. 10-129215). Asimismo, las piezas inventariadas como kimono en el Museo Nacional de las Culturas de la Ciudad de México son de los siglos XIX y XX y no guardan relación con la moda novohispana, ya que son de fechas posteriores a 1821 (n.º inv. 10-100032, 10-256377, 10-256380, 10-490851, 10-490852, 10-490853, 10-490854, 10-490857, 10-629821, 10-634808 1/11 y 2/11, 10-624819-2/8 y 3/8, 10-634822 1/7, 10-634823 0/2, 10-634824, 10-634825 0/2, 10-634826 0/2, 10-74916, 10-74917, 10-99555 0/7, 10-99971D, 10-99972D, 10-99974D, 10-99976).

Como se señaló en otros trabajos, entre todas las batas de corte asiático designadas de quimono, los ejemplares japoneses fueron muy raros y la única noticia conocida son unos "quimones súper finos, pelo Japón" que tenía el comerciante novohispano José Agustín García del Valle, en 1782 [16, 54]. Éstos podrían tratarse de *kimonos* o cualquier otro modelo hecho en ese territorio, con el cual se llegara a confundir. No es demás recordar que en el imperio español circularon otras prendas japoneses como los "20 cosodes de seda" que el jesuita napolitano Alessandro Valigniano envió al monarca durante el período de Unión de Coronas, alrededor de 1590. Se trataba de un traje menos ajustado que el *kimono*, descrito por el religioso como "una manera ordinaria de vestidos que se pareçen a n[uest]ras ropas largas que eran de maravillosa hechura, en unos caxones muy ricos dela hechura dela caxa dela carta aunque de otra forma" [17, 55].

En contrapartida, el comercio asiático proporcionó una enorme cantidad de *batas chinas,* algunas de las cuales ingresaron en los gabinetes reales [56]. Éstas pudieron imitar los modelos japoneses (los más demandados) y estar hechas con las mismas telas que importaba Japón desde China e India para confeccionar sus *kimonos* [22, 57]. Eso justificaría una confusión entre ambas prendas. Además de los *quimonos chinos* se detectaron referencias a otros trajes del Celeste Imperio que eventualmente pudieron ser catalogados genéricamente de quimono en otras ocasiones. Un ejemplo fue el regalo de "un vestido de mandarina de china con sus zapatos todo usado en 4 p[esos]" que hizo Don Ignacio Ponce de León a su hermana en 1785, religiosa profesa del Convento de la Concepción en Ciudad de México [58]. De esto se deduce que la prenda tuvo un uso femenino y que, pese a la obligatoriedad de observar las estrictas normas de la orden, hubo espacio para vestirse así en el convento. Lo que resulta extraño es que fuera usada. Se hallaron también unos "vestidos de china bordados" en Querétaro que podrán corresponder al mismo modelo [59].

Asimismo, Berenice Ballesteros [24, 60-61] identificó el uso de "ropones de sangley" por parte de comerciantes novohispanos, al menos desde 1589. Se trata de una clara alusión a la ropa que veían sobre los cuerpos de los chinos residentes en Manila y es posible que se hicieron ahí. El único ejemplar *de Filipinas* identificado hasta ahora es de 1720 y demuestra que existió una producción interna que, al menos puntualmente, se llegó a exportar [62]. En todo caso, esas piezas serían una minoría entre las mercancías cargadas en el galeón [63-64].

Aparentemente, la elaboración de estas piezas no se circunscribió a las regiones de Asia sino que se amplió a América. A finales del siglo XVIII, coincidiendo con la liberación de la manufactura de algodones pintados en 1772, proliferaron los ejemplares *mexicanos* y *criollos* por prácticamente todos los sectores de la población [17]. Además, se trasladaron a otras partes del continente donde todavía no fue posible encontrar evidencia de una producción interna.

En el virreinato del Perú, la noticia más antigua de una bata asiática no es en Lima, donde se instaló la Corte virreinal y las prácticas de ostentación serían más marcadas, sino en Salta. Ahí, fallecido el capitán Bernardo Blanco, en 1745, se registran entre sus bienes una "bata de angarípola de la China forrada" cuya tela remite para un patrón de rayas, y una "bata de raso de la China azul a flores anaranjada" [65]. Sería ya a finales del siglo cuando

la moda asiática alcanzaría la élite limeña, encontrándose entre las ropas de Antonio Barba, en 1799, "un poncho a la chinesca" y "ocho varas de saraza o quimon", que demuestran un gusto por la bata y por el tejido nombrados a la japonesa [66].

Con la formación del virreinato del Rio de la Plata, que incorporó Salta, se siguieron importando ropas asiáticas. El mercader de Buenos Aires, Manuel de Escalada Bustillos, tenía "tres batas de China para mujer" en 1774 [65]. Su uso femenino ha sido referido por las investigadoras María Marschoff y Melisa Salerno [67] quienes observaron que, a finales del siglo XVIII e inicios de la centuria siguiente, estos modelos se pusieron de moda en detrimento de las casacas y *déshabillés*. En todo caso, el análisis de los inventarios de bienes de Buenos Aires consultados sugiere que su uso no estuvo tan extendido como en la Ciudad de México y que los dos territorios fueron realidades muy distintas desde su fundación. Eso contrasta con la imagen general trasmitida por los recientes trabajos de Mariano Bonialian sobre la circulación de bienes asiáticos en el Río de la Plata y estaría más relacionada con las tesis sostenidas por Daniel Schávelzon [68], con base en los registros históricos y arqueológicos del Buenos Aires colonial.

En el virreinato de Nueva Granada, más concretamente en la Guayra (provincia de Caracas), se importaron quimonos de China desde Veracruz, como lo comprueba los envíos que en 1781 fueron en el navío Nuestra Señora de la Concepción [69]. El trabajo de Eduardo Arcila Farías [70] registra algunas remesas a Caracas durante el siglo XVIII pero, en esta fase, es inviable evaluar el grado de difusión de la prenda en ese territorio debido a la falta de investigaciones sobre los inventarios de bienes venezolanos.

Lo que se deduce del análisis de los quimonos en la Nueva España y de sus relaciones comerciales con el exterior es un relevante consumo de cortes de bata asiáticos, no necesariamente japoneses. La diversidad de centros de producción demuestra cómo se compraron piezas consideradas equivalentes a los *kimonos* en otras zonas de Asia y que eventualmente se pasaron a hacer también en los talleres locales. Al observar la circulación de esas prendas a partir del virreinato se entiende que la región ocupó una posición relevante en la distribución de ejemplares asiáticos hacia el resto del continente y de Europa. Sin embargo, no se detectó aún la importación de ningún quimono europeo.

Reconstruyendo el significado y la apariencia del quimono

Una curiosidad asiática en el siglo XVII

La clasificación del quimono como bata hace pensar que en el contexto hispano se le reconoció esa utilidad y que el aspecto que adquirían los cuerpos novohispanos no se parecería al del japonés vestido con *kimono*, ni tampoco a la imagen que tenían de los nipones. A pesar de que las expresiones artísticas locales no dejaron constancia de su aspecto a lo largo del siglo XVII si se preservan representaciones de asiáticos cuyos atributos incluyen un vestido particular. En muchas de las pinturas novohispanas sobre la evangelización y el martirio de religiosos en Asía aparecen japoneses, expresando la imagen que en el virreinato se tendría de sus trajes [71]. Al tomar como referente los murales de la catedral de Cuernavaca, que evocan a los mártires de Nagasaki, se observan unos atuendos que, según M.ª Helena Ota Mishima [72], se parecen a los de los *sangleyes* en el parían de Manila. Eso evidenciaría que no existía una noción clara de la indumentaria nipona o de las características que la distinguían de la china aunque algunas personas tuvieron ocasión de verla de primera mano, como señaló el noble indígena Chimalpahin [73] al describir la embajada de japoneses en México (1610-1614). Aparentemente, para los que pintaron esos diseños y su público, ambas figuras se fusionaban en un único ícono (arquetipo). Esta imagen era muy similar a la de los *chinos* de algunas pinturas o de aquellos que aparecían en escenas *achinadas* de varias manufacturas del virreinato. Son de ello ejemplo los personajes del biombo hecho en ese estilo que pertenece a la colección Franz Mayer. No obstante sus trajes se parecieran a los quimonos, éstos estaban lejos de considerarse ropas de levantar, tal como se usaban en Nueva España.

Esta idea sugiere que los quimonos no cumplieron la función de disfraz mediante el cual las personas quisieran asemejarse a los *japoneses* o *chinos* con quien tenían trato en Filipinas. El conocimiento sobre sus ropajes era algo difuso y sólo puntualmente se dibujó el *kimono* de manera realista. Ese es el caso de la escena del *Bautismo de San Francisco Xavier*, autoría de Juan Correa, o de los cuadros del martirio de San Felipe de Jesús que se encuentran, uno en la catedral de México, y el otro en el Museo Regional de Guadalupe en Zacatecas. Los tres ejemplares aparecen recogidos por Sofía de Sanabrais [74] para ilustrar las primeras percepciones de Japón en Nueva España, fechándolos entre 1650 y 1700. Según la autora, hay una gran probabilidad de que se basaran en grabados originales para ejecutarlos y serían representaciones claramente excepcionales.

Durante esta fase inicial, la prenda parece haberse circunscrito esencialmente al círculo de personas más vinculadas al negocio del galeón. Al contrario de la mayoría de los textiles importados de Asia, las ropas circularon en número bastante reducido y el traje se tornó un símbolo del prestigio de la élite mercantil novohispana. Además de su carácter exclusivo, éste establecía un vínculo inmediato entre el usuario y Asia a través de la apariencia, reflejando las conexiones por las que accedía a objetos tan singulares. Paralelamente, y sin nunca perder una asociación con lo *japonés* en el nombre, la forma de vestirlo lo asoció a la moda española. En ese entorno sociocultural emergían nuevas pautas de sociabilización y trabajo en ámbito doméstico, relacionadas con el despacho, que luego

se trasladaron a América. Tales cambios en la manera de vivir en casa afectaron eminentemente al género masculino y las clases más altas. Sobre todo, demandaron la creación de un protocolo específico para presentarse con dignidad en esas ocasiones, relacionando la mayor comodidad a la necesidad de ostentar. Eso se reflejó en la creciente importancia de la ropa de levantar, que creó la oportunidad y el marco para lucir la bata, o un *kimono* hecho bata, el quimono. Así se unía lo exótico, expresado en los tejidos y formas particulares de la prenda, al prestigio de la moda española frente a los modelos de otras matrices culturales.

Paralelamente a la asimilación de la prenda al guardarropa español en los territorios dominados por la Corona, pervivió en el imaginario una asociación con el estereotipo de chino o japonés. Eso sucedió durante las fiestas de canonización de San Ignacio de Loyola y San Francisco Xavier que se celebraron en varias ciudades del imperio a inicios del siglo XVII. Menciónese por ejemplo las fiestas de Lisboa, a las que asistió directamente el rey Felipe III, en 1622, cuando aún estaba vigente la unión ibérica. Durante el evento se representaron las cuatro partes del mundo. Chinos y japoneses aparecieron vestidos con trajes confeccionados en la península a la manera en que se usaban en esas regiones y que se describen como quimonos:

> Acompanhavão Asia sinco Provincias mui illustres, India, Arabia, Mogor, Chino & Japam; todas tam ricas, que bem motravaõ serem senhoras das riquezas Orientais; & tam proprias como se lá talharaõ os vestidos. O que se exergou particularmente na China, & Japam, que vestiaõ quimões de seda & oro trajo muito particular daquellas Regioes, na cabeça barretes a seu modo semeados de muita pedraria, leques nas maõs, catanas a tiracolo, os cavalos eraõ escolhidos, & ricamente ajaezados [75].

Ya en Evora, los japoneses aparecen vestidos con "chimaõ de hum sayo roxo, fundos de prata" [75].

No menos espectacular fueron las de Ciudad de México, en el mismo año, en las que se repite la representación del japonés, ya no la del chino, con un quimono. Éste aparece en el coro de los principales donde

> seguíase luego el prínçipe de Arima [ciudad de la provincia de Hizen] del Japón, don Protaçio [noble convertido al catolicismo, llamado Haronobu antes de su baustismo por los jesuitas y que fue ejecutado], que con rico jaés en el caballo, en trade de Japón, con un quemón rico labrado de oro y seda de barios colores, con vueltas de primavera. Acompañávanle quatro japones con sus catanas en la sinta, llebando dellos un escudo como el pasado, con su nombre [76].

Representando el triunfo de los santos,

> seguiase luego el Japon, y el que llevaba la tarja iba con un rico quemon de barias sedas realsadas con oro y plata. Seguíanse tras deste otros dos con jaeses asules y con el mesmo traje que el pasado, y en las cavelleras, a su usansa, muçhas perlas. Llevaban sus catanas asidad de cabrestillos de oro. Seguíase luego el Japon con adereço de riço de tigre, todo el cavallo de sintas encarnadas y de resplandor, que formaban bistosas rosas. Llevaba un quemón de primavera con guarnición de oro, y en él bordados muçhos pájaros, animales y flores de la tiera [76].

En esas ocasiones, el traje dejaba de ser una bata para transformarse de nuevo en *kimono,* fuera éste importado o hecho en algún taller local.

Expresión novohispana de una moda occidental en el siglo XVIII: estableciendo conexiones entre América y Europa

El siglo XVIII estuvo marcado por grandes cambios geopolíticos y tecnológicos que afectaron la administración del virreinato, los modelos económicos y el posicionamiento de las élites locales. Tales transformaciones repercutieron en la moda, especialmente en el incremento de quimonos. Como señaló Guillermina Solé Peñalosa [28], por primera vez se representó la prenda y, finalmente, se percibe como era o en que contextos se vestía.

Lo que primero destaca del análisis iconográfico es que en pleno siglo XVIII, cuando empiezan a representarse en la pintura, el traje adoptó formas y padrones variados. Estos elementos son importantes para rastrear el origen de las piezas y percibir si se confeccionaron en Japón con tejidos importados o hechos ahí bajo la influencia indiana. Otra posibilidad es que vinieran de otras regiones de Asia pero, por el momento, no se dispone de datos suficientes para hacer mayores consideraciones al respeto. Por lo general, los modelos guardan fuertes similitudes con los tipos más difundidos en Europa aunque no se detectara la atribución de una manufactura europea a ninguno de los quimonos descritos en los inventarios. Por eso, es posible pensar que el fenómeno de la moda asiática a lo largo de este período corresponde a una continuación de una tendencia anterior, aunque eventualmente sufriera influencias y absorbiera elementos de la *chinoiserie* europea, como sostiene Guillermina Solé Peñalosa [28].

El *wentka* holandés surgió como respuesta a la fuerte demanda de *Japonsche rock* (batas japonesas), también conocidas como *cambay* (en alusión a la India). Los primeros ejemplares llegaron a Ámsterdam en 1630-1640, coincidiendo con el inicio de las relaciones comerciales de la VOC a partir de la isla de Deshima, antes ocupada por la factoría portuguesa. A pesar de eso, sus relaciones con Japón remontan a 1609, cuando se autorizó su permanencia en Nagasaki, y cabe la posibilidad de que ya por entonces introdujera algunos ejemplares en Europa. En efecto, el investigador Kamada sugiere que el tejido indiano del tercer Lord de Kaga en Nagasaki, de 1637, fue comprado a la compañía, coincidiendo con las primeras referencias a ese comercio en sus registros [77].

Los trajes comercializados por la empresa holandesa se hacían específicamente para la exportación y todos los años el *shogun* ofrecía uno a su representante,

delicadamente doblado y guardado en una caja de laca [78-79]. Sus características recuerdan el envoltorio en el que el capitán Acosta trasportaba su quimono hacia Nueva España y que no era muy diferente al de la caja que preparó para su hermano, posiblemente porque esa era la forma habitual de acondicionar esas prendas para el comercio con los europeos y americanos. Los demás ejemplares adquiridos por los holandeses se conducían a Europa, donde inicialmente se aprovechó su tejido para confeccionar otras prendas. Sólo más tarde se usaron como batas, en substitución de los antiguos *tabbaard*, un tipo de bata [32]. Su ostentación frecuentemente relacionaba el individuo con ese mundo global, asociándolo a otros elementos materiales, particularmente en la pintura, en un proceso de domesticación de lo exótico que los volvió supuestamente holandeses [33]. De acuerdo a Anne Gerritesen, Europa fue la protagonista de esos procesos y desde ahí la prenda se expandió a los territorios ultramarinos, idea que se refuta en este trabajo al destacar el papel protagonista de la Nueva España en esas dinámicas [34]. La autora señala aún que en la iconografía su uso fue esencialmente doméstico, pero se sabe que los estudiantes de Leiden lo vestían en el exterior.

Rápidamente, las importaciones no pudieron suplir la demanda y surgieron interpretaciones locales, hechas para el consumo de sus habitantes [80]. Algunas de esas piezas más antiguas presentan formas ajustadas en la zona de la cintura y las mangas ceñidas (n.º de inv. HM.5425) [81], muy similares al quimono que pintó Ramón de Torres en el cuadro *De Castiza y Español, Española* [82]. Tales coincidencias se pueden deber a las relaciones de las naciones flamenca y holandesa con América durante el siglo XVIII. A través del establecimiento de compañías en Cádiz ellos compraron productos americanos como el índigo y eventualmente colocaron sus ropas en Nueva España [35].

Los motivos de las telas variaron entre fondo blanco con patrón de flores en tonos de azul o rojo y los estampados de flores contrastantes [36, 80, 83], y se conservan aún algunos de esos ejemplares (n.º inv. 21651 [84]. Éstos encuentran paralelo en las prendas usadas en Nueva España, aunque en la pintura predominara el primer tipo, como lo reflejan los cuadros de Luis de Mena (n.º inv. 00026) [85] o de José de Alcibar (n.º inv. 2014.217) [86].

En Francia, la prenda que cumplió la función del quimono fue el *robe de chambre* que, en grabados de diferentes autores, se utiliza para caracterizar el aspecto de académicos (Henri Bonnard, 1642-1711) [87] (Figura 1), nobles (autor desconocido) [88] (Figura 2) y

Figura 1. Henri Bonnart, detalle del grabado *Monsieir de l'Academie Francoise: en Robe de Chambre*. Fuente: Bibliothèque Nationale de France, département Bibliothèque-Musée de l'Opéra, RES-926 (9), https://gallica.bnf.fr/ark:/12148/btv1b10529631q/f56.item.

Figura 2. Autor desconocido, detalle del grabado *Montsieur le Noble*. Fuente: Bibliothèque Nationale de France, département Bibliothèque-Musée de l'Opéra, RES-926 (9), https://gallica.bnf.fr/ark:/12148/btv1b10529631q/f39.item.

Figura 3. Jaean Lepautre, detalle del grabado *Homme en Robe de Chambre*. Fuente: Bibliothèque Nationale de France, département Bibliothèque-Musée de l'Opéra, RES-926 (9), https://gallica.bnf.fr/ark:/12148/btv1b10529631q/f91.item.

Figura 4. Nicolas Bonnart, detalle del grabado *Homme en Robe de Chambre: Cette Robe d'Armenien Est un Deshabillé Coomode et l'on Sçauroit Trouver Rien de Plus Grave et Plus* à *la Mode*. Fuente: Bibliothèque Nationale de France, département Estampes et Photographie, RESERVE QB-201 (54)-FOL, https://gallica.bnf.fr/ark:/12148/btv1b84053101/f1.item.

otros personajes de la élite (Jaean Lepautre, 1618-1682) [89] (Figura 3). Este tipo de prenda se conoció también como *indienne*, en una clara alusión a la India aunque existieran algunos talleres locales [90]. Otro de sus referentes fueron los comerciantes armenios que, desde hacía siglos, servían de intermediarios entre Europa con diferentes regiones de Asia y Medio Oriente. Por eso, el grabador Nicolas Bonnart (1637?-1718) se refiere a ella como *robe d'Armenien* [91] (Figura 4).

La decoración varió mucho, desde sedas lisas y de tonos pálidos hasta motivos estampados. Uno de los patrones más recurrentes fue de rombos con flores como el del *robe de chambre* francés, datado de 1769 (n.º inv. 1976.149.1) [92] (Figura 5). Éste es muy idéntico al de la bata del cuadro *De Español y Morisca, Albino* (n.º inv. 00055) [93]. Los estampados de flores como el que aparece en el *Retrato de Hombre (Desconocido)*, de Carle Van Loo, ca. 1730-40, son más raros (n.º inv. MV 4484) [94] (Figura 6). La elección de este curioso patrón podrá justificarse por la influencia flamenca del pintor, de familia holandesa. Otra posibilidad, sostenida por algunos autores, es que la importancia de estas prendas como símbolo de ostentación motivó retratos con tejidos idealizados. No obstante, aparecen otras batas con motivos floridos y de tonos más fuertes, como en la estampa de *Mademoiselle d'Armagnac en Robe de Chambre*, hecha por Antoine Trouvain en 1695 [95] (Figura 7). Además, si se usaron en el virreinato, cabe la duda de si también pudieron venderse en Francia. Según el comerciante novohispano Francisco Ygnacio de Yraeta, muchas de las batas que se vestían en Nueva España a finales del siglo XVIII estaban inspiradas precisamente en la moda francesa. Eso es lo que se entiende de las consideraciones que hizo en una carta dirigida a Manuel Ramos de Lima, escrita en México a 6 de junio de 1770:

> Amigo, no habría de conocer vuestra merced a México, así en fábricas como en modas, pues las damas se están vistiendo a la "parisién" con especiales batas, que es ya lo ordinario y lo que más se usa, peinados de polvos con plumachos. Esto se ha introducido con motivo de la mucha oficialidad que hay en esta ciudad pues por orden de SM se ha hecho Plaza de Armas y hay

> tantos soldados que por las calles no se encuentra otra cosa. Se ha introducido mucha marcialidad, tanto que todas las damas parecen oficiales [96].

En Inglaterra predominó el *banyan*, hecho con tejidos del Coromandel y comercializado por la *British East India Company*. Por eso su nombre se formó a partir de una derivación de la palabra *banya,* que significaba mercader en el idioma gujarati [37]. Las adaptaciones que sufrieron, incluso en las colonias americanas, se inspiraron en el *jama*, un traje hindú usado en contextos informales y que estuvo muy de moda en las Cortes Mogol, Rajput y Deccani [38, 97]. Los ejemplares que se conservan hoy día guardan semejanzas con los quimonos novohispanos. Compárese por ejemplo el *banyan* de rayas producido en Europa durante la segunda mitad del siglo XVIII (n.º inv. CI 56.5.1a–c) [98] (Figura 8) al quimono del cuadro *De Español y Morisca, Albino*, de Andrés de Islas (n.º inv. 1980/03/06) [99]. En la documentación el patrón decorativo aparece en los 6 quimones listados que vienen de Filipinas, en 1732, al cuidado del capitán Don Andrés de Arguelles [100].

Figura 5. Banyan de seda y lino, francés, ca. 1750. Fuente: Metropolitan Museum of Art, https://www.metmuseum.org/art/collection/search/81528.

Figura 6. Carle Van Loo, *Retrato de Hombre (Desconocido)*. Fuente: Victoria & Albert Museum.

Respeto a la península ibérica, se carece de estudios sobre el tema en ese período, con excepción de una breve introducción de Pilar Cabañas Moreno sobre las primeras percepciones de la prenda en la región con base en los relatos de las embajadas japonesas [53]. Sería pues interesante analizar a fondo la documentación relativa a las importaciones, ya sea desde Europa, de América o a través de los navíos de la Armada y de la Compañía de Filipinas. Por el momento, resalta la ausencia de un programa iconográfico que incluyera el retrato masculino con esas batas, tal como sucedía en Nueva España y en otros países europeos. Asimismo aparece en otros estilos pictóricos como en las ocho pinturas de Domingo Martínez que captan el ambiente de las fiestas de coronación de Fernando VI (1746) en Sevilla, patrocinadas por la Real Fábrica de Tabacos (n.º inv. CE0550P a CE0557P). Su relevancia requeriría un análisis particular pero, por el momento, destaca la presencia de distintos personajes vestidos con unas bastas que se podrían clasificar de quimones, sobre todo en el carro del pregón de la máscara, donde iban los músicos con unas

Figura 7. Antoine Trouvain , detalle del grabado *Mademoiselle d'Armagnac: en Robe de Chambre*. Fuente: Bibliothèque Nationale de France, département Estampes et Photographie, RESERVE BOITE PET FOL-ZF-48, https://gallica.bnf.fr/ark:/12148/btv1b10537825g/f1.item.

prendas largas de tejidos de un único color, acompañadas de una especie de turbante [101].

A pesar de que no se localizara ningún retrato, la élite de la corte se ha vestido con estas batas y, en algunos casos, se llegaron a mandar pintar por artistas de renombre, al estilo de las que aparecen en las pinturas francesas y flamencas ya referidas. Se sabe, por ejemplo, que una de las hijas de Carlos III, la infanta María Josefa o su hermana María Luisa, encargó el estampado de uno de esos ejemplares al pintor de bodegones Pedro Pascual Lazcarro, alrededor de 1770 [102].

Todo indica que, en el contexto del imperio español, en la Nueva España, esta moda fue más expresiva, conectándose a las últimas tendencias del mundo occidental. Tal como en los Países Bajos, predominó su asociación a Japón perviviendo incluso después que se cortaran oficialmente las relaciones con la Corona española. Pese a que la principal vía de difusión fuera a través de Manila, jamás se sustituyó la palabra de origen japonesa por otra equivalente que remitiera a ese comercio por Filipinas, eventualmente porque ya por entonces esos trajes eran importados de muchos otros lugares. Otra posibilidad es que el protagonismo de la VOC en ese comercio influyera en la manera de nombrarlos en los territorios ultramarinos españoles. En efecto, varias casas comerciales de los Países Bajos tuvieron sus corresponsales en la Península Ibérica y, con frecuencia, se han inmiscuido en el negocio americano.

En pleno siglo XVIII, el referente parece haber sido la moda francesa, sobretodo en la península donde hubo una tendencia a designar las batas de inspiración asiática con un término francés, al contrario de los quimonos importados que se seguían vinculando a Japón. En Francia la conexión simbólica eran fundamentalmente los armenios o los habitantes de India. Ambos aparecen recogidos en un mapa de Filipinas de Murillo Velarde ofrecido, en 1734, por el mariscal de campo Fernando Valdés al rey, donde se ven los varios habitantes de las islas y sus batas diferentes pero, a pesar de que se conocían sus

Figura 8. Banyan de seda, britanico, ca. 1780. Fuente: Metropolitan Museum of Art, https://www.metmuseum.org/art/collection/search/81612.

Figura 9. *a)* Pedro Murillo Velarde, Pedro (1696-1753) y Nicolás de la Cruz Bagay (s. XVIII), *Carta Hydrographica y Chorographica de las Yslas Filipinas*, Manila, 1734. Fuente: Biblioteca Nacional de España, Biblioteca Digital Hispánica, http://bdh.bne.es/bnesearch/detalle/bdh0000024007. *b)* Detalle de cartelera con representación de *Christiano*, *Gentil Principal*, *Pescador con Chanchuy y Salacot* y Caegador con Pinga. *c)* Detalle de cartelera con representación de *[Negros] Cafres*, *Canarin* y *Lascar*. *d)* Detalle de cartelera con representación de pareja e hijo *Mestizos*, *Mardida* y *Japon[es]*. *e)* Detalle de cartelera con representación de *Español con Payo Alto*, *Negro Atezado Criollo de la Tierra*, *Indios Peleando Gallos* y *Aetas o Cimarrones del Norte*. *f)* Detalle de cartelera con representación de *Armenio ò Persa Chupando Tabaco*, *Mogol* y *Malabar*.

trajes, ellos nunca sirvieron de referente para nombrar los ejemplares novohispanos [103] (Figura 9).

Siendo el lenguaje uno de los elementos demarcadores del pensamiento, es incuestionable la asociación simbólica de esta ropa con Japón en el virreinato. Por otra parte, está claro por los inventarios de bienes y los registros iconográficos, que sus usuarios nutrían un gusto especial por objetos asiáticos o hechos baja su influencia. Por eso, se defiende que el quimono sirvió, en Nueva España, para complementar esos escenarios *achinados* que se diseñaban en el interior de las casas a través del mobiliario y también del cuerpo de algunas personas que circulaban por esos espacios. De tal manera así fue que las pinturas *achinadas* del siglo XVIII que representan episodios de la vida virreinal muestran a sus habitantes vestidos con largas batas. Eso sucede en el biombo con vista de la Ciudad de México y pelea de gallos (n.º inv. 2013/04/01) [104], en el que el quimono y las nubes *namban* recuerdan a Japón, y también en las escenas del biombo *achinado* de la colección de la Casa Museo de la Condesa de Lebrija, posiblemente novohispano [105]. El uso de la prenda en el exterior parece haber sido más reducido pero la enorme cantidad de textiles asiáticos, entre los que puntualmente circularon ejemplares nipones, trasladó esos escenarios del ámbito privado al público.

Conclusiones

El quimono fue como se conoció en castellano una prenda de tipo bata. A pesar de que su nombre remitiera a un vocablo de origen nipón, el termino se aplicó a todos los ejemplares que se percibían similares a los *kimonos* japoneses: los que se hacían ahí o en otras regiones de Asia pero también a sus interpretaciones americanas. Curiosamente nunca se empleó esa palabra en Nueva España para referirse a las versiones europeas de esas ropas.

La llegada de las primeras piezas al virreinato se relaciona con el incremento de las relaciones entre las potencias europeas y diferentes regiones de Asia. El establecimiento de nuevas rutas comerciales tuvo como consecuencia una enorme circulación de productos, entre los cuales se destacaron algunos objetos muy diferentes a aquellos con los que estaban familiarizados. Los trajes asiáticos fueron uno de esos materiales que empezaron a consumirse en Europa y América como piezas singulares y curiosas. Tal como varios autores ya destacaron antes, en cada región se adoptó una palabra diferente para designar esas novedades y, por lo general, se utilizó un termino asiático adaptado al idioma local. Si en castellano, portugués y en flamenco el referente fue Japón, en Francia e Inglaterra esas prendas remitían a India, donde mantenían sus principales entrepuestos comerciales en Asia. En cada uno de esos sitios empezaron a surgir manufacturas locales, adaptadas a las necesidades y gustos de su población que ejercieron su influencia en la moda peninsular y novohispana, designada en esos casos simplemente por bata o por términos de origen francés.

Lo novedoso de este estudio es que, por primera vez, se coloca el territorio americano en los principales debates en torno a la difusión de esas batas, evidenciando su participación en esas dinámicas. A lo largo del texto se ha expresado como la Nueva España tuvo un papel destacado en los procesos de expansión de esas mercancías en el contexto mundial y dentro del espacio dominado por el imperio español. Su posicionamiento estratégico entre Asia y Europa hizo que una gran parte de los productos asiáticos que circularon en las provincias americanas y europeas de la monarquía española pasaran antes por Acapulco. Por eso ahí se enviaron los primeros regalos de quimonos y fue donde los españoles o sus descendientes los empezaron a consumir. Además de su aparente preponderancia en el contexto estrictamente interno, el virreinato tuvo una presencia relevante en los procesos de difusión de la bata asiática en el entorno americano y en la metrópoli. El análisis comparado de los datos ha revelado que dicha región no sólo acompañó las principales tendencias en el mundo dicho occidental, sino que tuvo un papel activo. Como plataforma central de ese comercio, hay que integrar el virreinato a los mercados y modas globales sin considerarlo un mero receptor, sino que un agente que participó de esos fenómenos. Ahí se encontró la referencia más antigua a su uso fuera de Asia, aunque ésta se encuadra en la misma época en que se empezaba a difundir en otros espacios. Del mismo modo, una parte de los ejemplares consumidos en las principales ciudades americanas provenían del comercio con Nueva España.

Se podría decir que la difusión inicial del quimono resultó de un encuentro entre culturas diferentes y, sobre todo, de una atracción generalizada por los objetos curiosos que se producían en esos sitios lejanos. Es así como se perciben las primeras batas asiáticas en el virreinato, a veces guardadas en cajas de gran valor artístico que eventualmente sirvieron de escaparate para mostrarlas, más que para conservar una prenda de vestir. Aunque en ocasiones puntuales se pudieron usar, puestas sobre el cuerpo, se trataron claramente de situaciones excepcionales. Solamente en el siglo XVIII la prenda se incorporó verdaderamente al ajuar europeo y americano en un proceso de domesticación de lo exótico. Si primeramente la llegada del quimono motivó el reconocimiento de sus semejanzas con otras prendas usadas desde antes, como la bata, en un segundo momento se exaltaron las diferencias entre ambas. El quimono se asumió entonces como algo enteramente nuevo en relación a esos ejemplares más antiguos, concediéndole un valor especial. Su ostentación permitía que sus usuarios participaran directamente de una estética *achinada* a través de sus cuerpos, complementando la decoración material de los espacios interiores y exteriores.

Finalmente, el quimono se puede entender como un ejemplo de lo que ha sido definido como *pre-japonismo*. En Nueva España la atracción por el arte nipón se desarrolló dentro de un movimiento estético que tuvo como referente a China y que se manifestó en múltiples manufacturas locales *achinadas*. Al igual que sucedió con

el *japaning* y los muebles de laca, el traje japonés influyó en la emergencia de interpretaciones locales.

Curiosamente, los quimonos que se consumieron en el virreinato guardan semejanzas con los modelos adoptados por algunas regiones de Europa. Si, como se ha visto hasta ahora, las batas que llegaban desde el Viejo Continente nunca se designaron quimonos, entonces los aspectos compartidos en el corte y en el patrón decorativo de los tejidos demuestran una estrecha relación entre Nueva España y otras potencias del Viejo Mundo. Eso sin pasar necesariamente por las provincias peninsulares donde la moda del quimono no se expresó con la misma intensidad, al menos en lo que concierne al estilo de pintura retratista sobre el que se centró la atención. Tales contactos pudieron circunscribirse al ámbito comercial, compartiendo centros proveedores o manteniendo relaciones directas para realizar esos negocios, o incluso extenderse al campo de las interpretaciones *japonas* y *chinas*. No obstante no es posible determinar aún la injerencia de esos comerciantes extranjeros en Filipinas ni saber si los quimonos representados en la pintura novohispana tuvieron como referente modelos *de la tierra* o importados. Cuando éstos se hacían ahí, con frecuencia se aplicaron los materiales textiles y tintóreos autóctonos, convirtiéndolos en verdaderas piezas novohispanas que recordaban simultáneamente a los originales nipones y a las interpretaciones europeas.

Aunque se empleara la palabra de origen nipona para nombrar a estas ropas, el modo de usarlas remitía a la costumbre europea y eran muy distintas del *kimono*. Por eso, cuando los pintores novohispanos representaron a los japoneses a lo largo del siglo XVIII, sus ropas no se parecían mucho a los quimonos. Por el contrario, en las escenas *achinadas* que tuvieron como protagonistas los espacios y los habitantes del virreinato, la prenda predominante para personificar las élites novohispanas era el quimono. A pesar de que se trataran de escenarios idealizados, los trajes *xapones* remitían a una práctica vigente, haciendo el puente entre los varios niveles de la realidad: la de la vida social y la de las representaciones simbólicas. Si en el primer caso es muy difícil imaginar lo que una persona sentiría al vestir un quimono, en las pinturas *achinadas* la prenda surge en consonancia con otros íconos nipones como las nubes o los aves fénix, característicos del arte *namban*.

ORCID

Andreia Martins Torres
https://orcid.org/0000-0003-4650-2279

Referencias

1 Almazán Tomás, D., 'Relaciones artísticas hispano-japonesas en el Siglo de Oro', in *Japón y España: Acercamientos y Desencuentros (Siglos XVI y XVII),* ed. M. J. Zamora, Editora Satori, Gijon (2012) 29-46.

2 Carr, D. (ed.), *Made in the Americas. The New World Discorvers Asia,* Museum of Fine Arts Boston, Boston (2015).

3 García Gutiérrez, F., *Japón y Occidente. Influencias Recíprocas en el Arte,* Ediciones Guadalquivir, Sevilla (1990).

4 Mínguez, V.; Rodríguez, I., 'Japan in the Spanish Empire. Circulation of works of art and imaginings of Cipango in Metropolitan Spain and the American viceroyalties', *Bulletin of Portuguese-Japanese Studies* **19** (2009) 9-20.

5 Ivey, O. T., *Relations Between Japan and Mexico 1598-1930,* University of Chicago, Chicago (1931).

6 Junkichi, M., *Japanese Art in the West,* Mayuyama & Co. Ltd., Tokyo (1966).

7 Ocaña, S., 'Marcos enconchados: autonomía y apropiación de formas japonesas', *Anales del Instituto de Investigaciones Esteticas* **30** (92) (2008) 107-153, http://dx.doi.org/10.22201/iie.18703062e.2008.92.2262.

8 Kawamura, Y., 'Laca *urushi* de estilo Namban y sus influencias en las artes de la América virreinal. Un estudio a través de las obras conservadas en Navarra', in *Laca Namban. Brillo de Japón en Navarra,* Gobierno de Navarra, Pamplona (2016) 22-59.

9 Baena Zapatero, A., 'Chinese and Japanese influence on colonial Mexican furniture: the achinado folding screens', *Bulletin of Portuguese-Japanese Studies* **20** (2010) 95-123.

10 Curvelo, A., 'The artistic circulation between Japan, China and the New-Spain in the 16th-17th Centuries', *Bulletin of Portuguese-Japanese Studies* **16** (2008) 59-69.

11 Sanabrais, S., 'The biombo or folding screen in colonial México', in *Asia & Spanish America. Trans-pacific Artistic and Cultural Exchange, 1500-1850,* ed. R. Otsuka & D. Pierce, Denver Art Museum, Denver (2006) 69-106.

12 Curiel, G., 'Al remedo de la China: El lenguaje achinado y la formación de un gusto dentro de las casas novohispanas', in *Orientes y Occidentes: El Arte y la Mirada del Otro*, ed. G. Curiel, Instituto de Investigaciones Estéticas, Ciudad de México (2007) 299-317.

13 Jacobson, D., *Chinoiserie,* Phaidon Press, Londres (1999).

14 Mason, P., *Infelicities. Representations of the Exotic*, The Johns Hopkins University Press, Baltimore (1998).

15 Berg, M., 'In pursuit of luxury: global history and british consumer goods in eighteenth century', *Past and Presente* **182**(1) (2004) 85-142, https://doi.org/10.1093/past/182.1.85.

16 Martins Torres, A., 'El uso de quimonos en la Nueva España. Difusión de un traje japonés en el s. XVIII', in *Espacios de Tránsito. Procesos Culturales Entre el Atlántico y el Pacífico,* ed. M. I. Montoya Ramírez & M. A. Sorroche Cuerva, Editorial Universitaria, Granada (2014) 171-187.

17 Martins Torres, A., 'Quimonos chinos y quimones criollos. La moda novohispana en el cruce entre Oriente y Occidente' in *La Nao de China: Navegación, Comercio e Intercambios Culturales,* ed. S. Bernabéu, Universidad de Sevilla, Sevilla (2013) 247-280.

18 Tanimoto, M., 'A foreign fibre in early modern Japan', in *The Spinning World: A Global History of Cotton Textiles, 1200–1850,* ed. G. Riello & P. Parthasarathi, Oxford University Press, Oxford (2009) 194-201.

19 Dalby, L. C., *Kimono: Fashioning Culture*, University of Washington Press, Seatle (2001).

20 Matsunosuke, N., *Edo Culture. Daily Life and Diversions in Urban Japan, 1600-1868,* University of Hawai'i Press, Honolulu (1997).

21 Gluckman, D. C.; Takeda, S., *When Art Became Fashion: Kosode in Edo-Period Japan*, County Museum of Art, Los Angeles (1992).

22 Fujita, K., 'Japan Indianized: the material culture of imported textiles in Japan, 1550–1850', in *The Spinning World: a Global History of Cotton Textiles, 1200–1850*, ed. G. Riello & P. Parthasarathi, Oxford University Press, Oxford (2009) 181-204.

23 Archivo General de Indias, Sevilla, *Filipinas*, 67, f. 8v.

24 Ballesteros, B., 'El menaje asiático de las casas de élite comercial del virreinato novohispano en el siglo XVII', *Boletin del Archivo General de la Nación* **6** (20) (2008) 91-92.

25 Pérez Monroy, A. J., 'Modernidad y modas en la Ciudad de Mexico: de la basquiña al túnico del calzón al pantalón', in *Bienes y Vivencias. El siglo XIX*, ed. A. Staples & P. Gonzalbo, Fondo de Cultura, México (2005) 51-80.

26 Arechavala, M. del C., 'Visión femenina y masculina de la indumentaria decimonónica a través de la literatura y las artes: Claudio Linati, Madame Calderón de la Barca y Manuel Payno', tesis de mestria, UNAM, México (2008).

27 de los Angeles Navarrete Calatayud, M., 'El léxico del vestuario de la Nueva España. Descripción y diacronía', tesis de licenciatura, UNAM, México (1994).

28 Solé Peñalosa, G., 'Verdugados, guardainfantes, valonas y sacristanes: La indumentaria, joyería y arreglo personal en el siglo XVII novohispano', tesis doctoral, UNAM, México (2009).

29 Woodyard, S., 'Wrapping gown', in *Clothing and Fashion: American Fashion from Head to Toe,* ed. J. Blanco & M. Doering, vol. 1, ABC-CLIO, California (2016) 320-321.

30 Baumgarten, L., *What Clothes Reveal: The Language of Clothing in Colonial and Federal America*, Yale University Press, Yale (2002).

31 Maeder, E., *A Man's Banyan: High Fashion in Rural Massachusetts*, Historic Deerfield Inc., Deerfield (2001).

32 Winkel, M., *Fashion and Fancy: Dress and Meaning in Rembrandt's Paintings*, Amsterdam University Press, Amsterdam (2006) 27-50.

33 Hollander, M., 'Vermeer's robe: costume, commerce, and fantasy in the early modern Netherlands', *Dutch Crossing* **35**(2) (2011) 177-195, https://doi.org/10.1179/155909011X13033128278713.

34 Gerritsen, A., 'Domesticating goods from overseas: global material culture in the early modern Netherlands', *Journal of Design History* **29**(3) (2016) 228-244, https://doi.org/10.1093/jdh/epw021.

35 Crespo Solana, A., 'A network-based merchant empire. Dutch trade in the hispanic atlantic (1680-1740)', in *Dutch Atlantic Connections, 1680-1800. Linking Empires, Bridging Border,* ed. G. Oostindie & J. Roitman, Brill, Leiden-Boston (2014) 139-158, https://doi.org/10.1163/9789004271319_008.

36 du Mortier, B., 'Men's fashion in the Netherlands (1790–1830). Caught between France and England', *Costume* **22**(1) (2013) 51-59, https://doi.org/10.1179/cos.1988.22.1.51.

37 Yule, H.; Burnell, A., *Hobson-Jobson: A Glossary of Colloquial Anglo-Indian Words and Phrases, and of Kindred Terms, Etymological, Historical, Geographical and Discursive*, Wordsworth, Hertfordshire (1996) 64-75.

38 Doering, M., 'Banyan dressing gown, 1715-1785', in *Clothing and Fashion: American Fashion from Head to Toe,* ed. J. Blanco & M. Doering, vol. 1, ABC-CLIO, California (2016) 30-32.

39 Arquivo Nacional da Torre do Tombo, Lisboa, Arquivo dos Condes de Ponte, Caixa 3 (Mello e Torres), doc. MT-10, f. 34-49.

40 Mundy, P., *The Travels of Peter Mundy in Europe and Asia 1608-1627*, Londres, Hakluyt Society (1919) 64.

41 Ferreira, M. J., 'Os têxteis chineses em portugal nas opções decorativas sacras de aparato (séculos XVI-XVIII)', vol. 1, Tesis de doctorado, Universidade do Porto, Porto (2011) 300, 314, 342.

42 La Premiere Ambassade du Japon en Europe 1582-1592. Première Partie : Le Traité du Père Frois, ed. J. A. Abranches Pinto, Y. Okamoto; H. Bernard, Tokyo, Sophia University (1942).

43 Strbáková, R., 'Procesos de cambio léxico en el español del siglo XIX: el vocabulario de la indumentaria', tesis doctoral, Universidad de Granada, Granada (2007) 600-604.

44 Leira Sánchez, A., 'El vestido y la moda en tiempos de Goya', in *Textil e Indumentaria: Materias, Técnicas y Evolución*, U.C.M., Madrid (2003) 205-219.

45 Swain, M., 'Nightgown into dressing gown: a study of men's nightgowns, eighteenth century', *Costume* **6** (1972) 10-21, https://doi.org/10.1179/cos.1972.6.1.10.

46 Zimmerman, R., 'Global luxuries at home: the material possessions of an elite family in eighteenth-century Minas Gerais, Brazil', tesis doctoral, University of Delaware, Delaware (2017) 201-202.

47 Arquivo Nacional da Torre do Tombo, Lisboa, *Inquisição de Lisboa*, n13360, s.f.

48 Bandrés, M., *La Moda en la Pintura: Velázquez*, Universidad de Navarra, Pamplona (2002) 267-293.

49 Archivo General de la Nación, México, Civil, vol. 1998, exp. 3.

50 Barrón, C., 'La presencia holandesa en Japón y el comercio con la Nueva España en el siglo XVII', in *Memorias Compartidas. Intercambios Culturales, Relaciones Comerciales y Diplomáticas Entre México y los Países Bajos,* ed. L. Pérez Rosales & A. van der Slius, Departamento de Historia de la Universidad Iberoamericana-Embajada de los Países Bajos, México (2009) 123-147.

51 Iaccarino, U., 'El papel del galeón de Manila en el Japón de Tokugawua Ieyasu (1598- 1616)', in *Un Océano de Seda y Plata: el Universo Económico del Galeón de Manila,* ed. S. Bernabeú & C. Martínez Shaw, CSIC, Sevilla (2013) 133-153.

52 Gil, J., *La India y el Lejano Oriente en la Sevilla del Siglo de Oro*, ICAS, Sevilla (2011).

53 Cabañas Moreno, P., 'El kimono como icono turístico', *Además De – Revista On Line de Artes Decorativas y Diseño* **3** (2017) 98-113.

54 Archivo General de la Nación, México, Consulado, vol. 82, exp. 6, f. 190.

55 Real Academia de la Historia, Madrid, Jesuitas, Tomo 116, 9/3689, ff.71v-71r.

56 García-Abásolo, A., 'Ensayando una doble vía', in *El Galeón de Manila*, ed. P. Barraca de Ramos, Ministerio de Educación, Cultura y Deporte Madrid (2000) 215-226.

57 Sadao, N., 'The formation of the early Chinese cotton industry' in *State and Society in China: Japanese Perspectives on Ming-Quing Social and Economic History,* ed. L. Grove & V. Daniels, University of Tokyo Press, Tokyo (1984) 17-78.

58 Archivo General de Indias, Sevilla, Filipinas, vol. 950, f. 332r.

59 Archivo General de la Nación, México, Ind. Vir., vol. 1712, exp. 9, f. 74.

60 Archivo General de la Nación, México, Real Fisco de la Inquisición, vol. 3, exp. 51, año de 1589.

61 Archivo General de la Nación, México, Tierras, vol. 1257, exp. 1, año de 1695.

62 Curiel, G., 'Consideraciones sobre el comercio de obras suntuarias en la Nueva España', in *México Colonial*, ed. M. C. García Sáiz, Museo de América, Madrid (1989) 53-71.

63 Alonso, L., *El Costo del Imperio Asiático. La Formación Colonial de las Islas Filipinas,* Instituto Mora-Universidade da Coruña, México-Coruña (2009).

64 Yuste, C., *Emporios Transpacíficos. Comerciantes Mexicanos en Manila. 1710-1815,* Instituto de Investigaciones Históricas-UNAM, Ciudad de México (2007).

65 Bonialian, M., *China en la América Colonial: Bienes, Mercados, Comercio y Cultura del Consumo Desde México Hasta Buenos Aires*, Instituto Mora, Ciudad de México (2014) 229, 236.

66 Archivo General de la Nación, Lima, Protocolos Notariales, escribano Justo Mendoza y Toledo, vol. 729, 1799, f. 421r-437r.

67 Marschoff, M.; Salerno, M., 'Abriendo baúles y desempolvando guardarropas. Mujeres y prácticas del vestido en el Buenos Aires virreinal', *Anuario de Estudios Americanos* **73** (1) (2016) 153-155, https://doi.org/10.3989/aeamer.2016.1.05.

68 Schávelzon, D., *Arqueología Histórica de Buenos Aires: La Cultura Material Porteña de los Siglos XVIII y XIX*, Corregidor, Argentina (1991).

69 Archivo General de la Nación, México, Real Hacienda, Vol. 34, exp. 1, f. 188.

70 Arcila Farías, E., *Comercio Entre México y Venezuela en los Siglos XVI y XVII*, Instituto Mexicano de Comercio Exterior, Ciudad de México (1975).

71 Bargellini, C.; Komanecky, M.; Weber, D. (eds.), *El Arte de las Misiones del Norte de la Nueva España, 1600-1821,* Colegio de San Ildefonso, Ciudad de México (2009).

72 Ota Mishima, M. E., 'Los murales novohispanos en la catedral de Cuernavaca: los veintiséis mártires de Nagasaki', *Estudios de Asia y Africa* **16** (4) (1981) 675-696.

73 Chimalpahin, D., *Diario*, ed. R. Tena. Conaculta, México (2001) 217-221.

74 Sanabrais, S., '"The Spaniards of Asia': The Japanese presence in colonial Mexico', *Bulletin of Portuguese - Japanese Studies* **18-19** (2009) 223-251.

75 *Relações das Sumptuosas Festas, com que a Companhia de Jesus da Provincia de Portugal Celebrou a Canonizaçaõ de S. Ignacio de Loyola, e S. Francisco Xavier*, Lisboa (1622) f. 23r-24, f. 96.

76 de León, M., *Fiestas de Madrid, Celebradas a XIX de Junio de 1622 A*ños, en la *Canonizacion de San Isidro, S. Ignacio, S. Francisco Xavier, S. Felipe Neri Clerigo Presbiterio Florentino, y Santa Teresa de Iesus*, Madrid (1622) f. 178r- 203r.

77 Kamada, Y., 'The use of imported Persian and Indian textiles in early modern Japan', in *Textiles and Politics: Textile Society of America 13th Biennial Symposium Proceedings*, Textile Society of America, Washington (2012).

78 Lemire, B., 'Fashioning global trade: Indian textiles, gender meanings and European consumers, 1500-1800', in *How India Clothed the World,* ed. G. Riello & T. Roy, Brill, Leiden (2009) 373.

79 Vermeulen, T., *The Deshima Dagregisters. Their Original Tables of Contents,* vol. 2 (1690-1700), Centre For the History of European Expansion, Leiden (1987).

80 Breukink-Peeze, M., 'Japanese robes, a craze', in *Imitation and Inspiration. Influence on Dutch Art*, ed. S. Van Raay, D'Arts, Amsterdam (1989) 53-60.

81 'Lange vrouwenjas of wentke, Hindeloopen', in Geheugen van Nederland, Nederlands Openluchtmuseum, Arnhem, http://www.geheugenvannederland.nl/en/geheugen/view?coll=ngvn&identifier=NOMA01%3AHM5425 (acceso 2018-3-13).

82 Katzew, I., *La Pintura de Castas. Representaciones Espaciales en el México del Siglo XVIII*, Turner, Madrid (2004) fig. 150.

83 du Mortier, B., 'Silk japonsche rockts in Holland in the seventeenth and eighteenth century', *Dresstudy* **21** (1992) 6-9.

84 'Herenkamerjas', Central Museum, Utrecht, https://www.centraalmuseum.nl/en/collection/21651-herenkamerjas-anoniem (acceso 2019-2-10).

85 '00026', in Museo de América de Madrid, Madrid, http://ceres.mcu.es/pages/Viewer?accion=4&AMuseo=MAM&Museo=MAM&Ninv=00026 (acceso 2018-3-13).

86 'De Espanol y Negra, Mulato (From Spaniard and Black, Mulatto)', in Denver Arte Museum, Denver, https://denverartmuseum.org/object/2014.217 (acceso 2018-3-13).

87 Bonnart, H., 'Monsieur de l'Academie Françoise en robe de chambre', https://gallica.bnf.fr/ark:/12148/btv1b10529631q/f56.item (acceso 2018-3-13).

88 'Monsieur le noble', Paris (1695) https://gallica.bnf.fr/ark:/12148/btv1b10529631q/f39.item (acceso 2018-3-13).

89 Lepautre, J., 'Homme en robe de chambre', Paris, https://gallica.bnf.fr/ark:/12148/btv1b10529631q/f91.item (acceso 2018-3-13).

90 Thoisy-Dallem, A., 'La robe de chambre d'Oberkampf. Un témoignage rare du vêtement d'intérieur à la fin du XVIII^{e} siècle', *La Revue des Musée de France: Revue du Louvre* **3** (2003) 82-85.

91 Bonnart, N., 'Homme en robe de chambre', Paris (1675), https://gallica.bnf.fr/ark:/12148/btv1b84053101.r=hennin%204865?rk=21459;2 (acceso 2018-3-13).

92 'Banyan', in Metropolitan Museum of Art, New York, https://www.metmuseum.org/art/collection/search/81528 (acceso 2018-3-13).

93 '00055', in Museo de América de Madrid, Madrid, http://ceres.mcu.es/pages/Viewer?accion=4&AMuseo=MAM&Museo=MAM&Ninv=00055 (acceso 2018-3-13).

94 Miller, L., 'A portrait of the "Raphael of silk design"', *V&A Online Journal* **4** (2012), http://www.vam.ac.uk/content/journals/research-journal/issue-no.-4-summer-2012/a-portrait-of-the-raphael-of-silk-design/ (acceso 2018-3-13).

95 Trouvain, A., 'Mademoiselle d'Armagnac en robe du chambre', 2ª ed., Paris (1695), https://gallica.bnf.fr/ark:/12148/btv1b10537825g (acceso 2018-3-13).

96 Torales, M. C., *La Compañia de Comercio de Francisco Ignacio de Yraeta (1767-1797)*, vol. 2, IMCE, México (1985) 185-186.

97 Wimberley, V., 'Banyan', in *Clothing and Fashion: American Fashion from Head to Toe,* ed. J. Blanco & M. Doering, vol. 1, ABC-CLIO, California (2016) 44-54.

98 'Banyan', in Metropolitan Museum of Art, https://www.metmuseum.org/art/collection/search/81612 (acceso 2018-3-13).

99 '1980/03/06', Museo de América de Madrid, Madrid, http://ceres.mcu.es/pages/Viewer?accion=4&AMuseo=MAM&Museo=MAM&Ninv=1980/03/06 (acceso 2018-3-13).

100 Archivo General de la Nación, México, Ind. Vir., vol. 5440, exp. 42, f.1.

101 'CE0550P', Museo de Bellas Artes de Sevilla, Sevilla, http://ceres.mcu.es/pages/Viewer?accion=4&AMuseo=MBASE&Ninv=CE0550P (acceso 2018-3-13).

102 Real Academia de Bellas Artes de San Fernando, Madrid, Libro de Juntas, 3-83, fol. 108r.

103 Murillo Velarde, P.; Bagay, N. C. , 'Carta Hydrographica y chorographica de las yslas Filipinas', Manila (1734) http://bdh.bne.es/bnesearch/detalle/bdh0000024007 (acceso 2018-3-13).

104 '2013/04/01', Museo de América de Madrid, Madrid, http://ceres.mcu.es/pages/Viewer?accion=4&AMuseo=MAM&Museo=MAM&Ninv=2013/04/01 (acceso 2018-3-13).

105 Montes González, F., 'Pintura virreinal americana en Sevilla. Contextos, historiografía y nuevas aportaciones', *Archivo Hispalense* **276-278** (2008) 371-373.

Recibido: 2018-3-8
Revisto: 2018-12-7
Aceptado: 2018-12-8
Online: 2019-2-14

Estudos sobre têxteis históricos
Studies in historical textiles
A. Serrano, M. J. Ferreira, E. C. de Groot (ed.)

Article / Artigo

Characterizing historical textiles and clothing with proteomics

Caroline Solazzo

Proteomics and Biomolecular Mass Spectrometry Laboratory, Museum Conservation Institute (MCI), Smithsonian Institution, 4210 Silver Hill Road, Suitland, MD 20746, USA
solazzoc@si.edu

Abstract
This paper is a review of proteomics and mass spectrometric techniques used for the study of historical textiles and garments. First applied on archaeological animal fibers over a decade ago, proteomics has made important contributions to the analysis of ancient proteins and to cultural heritage studies. The field of proteomics has the potential to give a better understanding of the modes of fabrication of ancient textiles, their composition and pathways of degradation, as well as the development of animal fibers through domestication and breeding. This review summarizes current analytical methods, describes the different sources of animal fibers and their biomolecular characteristics and methods of analysis, and finally presents the main applications of proteomics to historical clothing.

Keywords
Proteomics
Mass spectrometry
Amino acids
Leather
Hair
Wool
Silk

Caracterização de têxteis e vestuário históricos por meio da proteómica

Resumo
Este artigo é uma revisão das técnicas de proteómica e de espectrometria de massa aplicadas ao estudo de têxteis e vestuário históricos. Inicialmente usada para o estudo de fibras animais arqueológicas há mais de uma década, a proteómica tem proporcionado contribuições importantes para a análise de proteínas antigas e para os estudos do património cultural. A proteómica tem a vantagem de oferecer uma melhor compreensão sobre os modos de fabrico de têxteis históricos, a sua composição e os processos de degradação, assim como sobre o desenvolvimento de fibras animais através de processos de domesticação e reprodução. Esta revisão apresenta os métodos analíticos actuais, descreve as diferentes fibras animais, as suas características biomoleculares e respectivos métodos de análise e, por último, apresenta as principais aplicações da proteómica ao estudo de têxteis e vestuário históricos.

Palavras-chave
Proteómica
Espectrometria de massa
Aminoácidos
Couro
Pelo
Lã
Seda

ISSN 2182-9942

Conservar Património **31** (2019) 97-114 | https://doi.org/10.14568/cp2018031
ARP - Associação Profissional de Conservadores-Restauradores de Portugal
http://revista.arp.org.pt

Outline

Introduction to proteomics on textiles

Since the introduction of proteomics to archaeological and cultural heritage studies in the early 2000s, proteins have been better characterized in an increasing variety of ancient substrates and materials [1-3], in particular to identify their species of origin [4]. Proteomics is a suite of techniques based on mass spectrometric analysis that studies the protein composition of tissues or other biological systems. Proteomics differs from genomics, which relates to the study of the complete set of genes from the genome and the analysis of DNA. The protein sequence is obtained from genes and the total of all proteins composing a sample or tissue is called a proteome. For historical textiles and clothing, characterizing ancient proteins has relevance for questions such as techniques of fabrication, material availability and variety, trade of materials, domestication and breeding of animals [5-10]. In addition, a thorough understanding of the factors and changes affecting proteins in fibers can be achieved using proteomics techniques [11-13]. Indeed, animal fibers undergo many processing steps that may induce damage at the protein level, and more specifically on the building blocks of proteins, the amino acids. Proteins are affected by their environment during production and collection from the animal, by the mechanical processes of producing the yarns and by the chemical treatments necessary to obtain the optimized final thread.

Proteomics techniques give a range of information from the quick snapshot of the main peptide markers present in a sample, also known as peptide mass fingerprinting (PMF) [14] to the complex analysis of the proteome (for example wool [15]) and of the possible modifications affecting proteins:

1) Peptide mass fingerprinting is an efficient method to identify keratinous tissues to species when the recognizable structural information has not survived (e.g. the scales on hair). The identification is based on the presence of specific markers (peptides obtained by digestion of proteins) [16-17], and requires small amounts of samples. PMF analysis can be successful with samples that have been exposed to archaeological environments as varied as bogs and peat, waterlogged soils, anaerobic rich urban deposits, arid, permafrost and frozen soils, or preserved through mineralization and pseudomorphism.
2) In mixed or complex substrates, mass spectrometric analysis is performed after separation of the proteins and peptides (using chromatography or electrophoresis), so that identification is achieved on a maximum number of peptides, including those that bear modifications (see 4). Complex samples can be threads with multiple fiber types (e.g. dog and goat fiber blend in Coast Salish blankets [6]), or samples that contain multiple protein layers (e.g. metal threads made of an animal membrane substrate with protein binders [8]).
3) The characterization of the full proteome of animal fibers is an arduous task but one that has been facilitated in recent years by higher instrument sensitivity and increasing access to genomic information. Analysis of the proteome has the potential to reveal relationships between close species or sub-species (e.g. domesticated silk vs wild silk), and to evaluate morphological changes in fibers in correlation to expression and quantitation of proteins (e.g. fineness of wool).
4) Finally, proteomics is used for studying the degradation of proteins, which is evaluated through protein hydrolysis and chemical modifications. Many events influence the degradation of proteins: (i) processing (mordanting, dyeing, weighting, tanning, etc), (ii) interaction with other materials and products of degradation of these materials (e.g. fats, resins or other proteins), (iii) burial contexts or environmental conditions during the lifespan of the object and (iv) conservation/restoration treatments and modern display conditions of the object (pollution, light).

Fibrous proteins in textiles

Proteins: general introduction

Proteins are made of long chains of amino acids (called residues when they are linked by peptidic bonds in the protein chain), forming polypeptides. They are macromolecules of high molecular weight, ranging from a few dozen residues (e.g keratin-associated proteins in wool) to thousands of residues for the largest proteins (e.g. heavy-chain fibroin in silk). Twenty amino acids are used to form proteins, whose sequences are encoded by the genetic code. Amino acids consist of an amine group (NH_2), a carboxyl group (COOH) and a variable R group known as the side chain that gives the amino acid its specific chemical properties (Table 1). The sequence of amino acids (primary structure), through the combined properties of the R groups, determines the shape (secondary and tertiary structures) and function of the protein. Structural proteins, such as collagen in skin (e.g. leather), keratin in hair and wool, and fibroin in silk, are fibrous proteins [18] that provide mechanical support, strength, and a protective framework. They have three-dimensional structures in the form of alpha-helix (alpha-keratin), beta-pleated sheets (heavy-chain fibroin), or triple helix (collagen).

Hair, wool and fur: keratinous proteins

Introduction

Animal hair is the most common proteinaceous fiber used in textiles; while the overall protein composition in hair is similar across species and consists mainly of trichocyte keratin proteins (α-keratin), there is a large range of fiber types that has resulted in different usages for the fibers. The fur of animals such as seal, mink or fox provides high thermal insulation by trapping air in their densely packed undercoat of very fine and short hair. In otters for instance, the density of hair and a pattern of cuticular scales that favor interlocking of hair contribute to keeping water from reaching the undercoat [19]. The coat of animals such as rabbit, sheep and especially beaver were used for felt (e.g. beaver felt hats were of high fashion during the 17th-18th c. in Europe [20]). For woven textiles, wool has been a

Table 1
List of amino acids composing proteins

Amino acid	3-letter code	1-letter code	Side -chain	Property
Alanine	Ala	A	$-CH_3$	Hydrophobic
Arginine	Arg	R	$-(CH_2)_3NH-C(NH)(NH_2)$	Basic, polar
Aspartic acid	Asp	D	$-CH_2COOH$	Acidic, polar
Asparagine	Asn	N	$-CH_2CONH_2$	Polar
Cysteine	Cys	C	$-CH_2SH$	Polar
Glutamic acid	Glu	E	$-CH_2CH_2COOH$	Acidic, polar
Glutamine	Gln	Q	$-CH_2CH_2CONH_2$	Polar
Glycine	Gly	G	-H	Hydrophobic
Histidine	His	H	$-CH_2-C_3H_3N_2$	Basic, polar, aromatic
Isoleucine	Ile	I	$-CH(CH_3)CH_2CH_3$	Hydrophobic, aliphatic
Leucine	Leu	L	$-CH_2CH(CH_3)_2$	Hydrophobic, aliphatic
Lysine	Lys	K	$-(CH_2)_4NH_2$	Basic, polar
Methionine	Met	M	$-CH_2CH_2SCH_3$	Hydrophobic
Phenylalanine	Phe	F	$-CH_2C_6H_5$	Hydrophobic, aromatic
Proline	Pro	P	$-CH_2CH_2CH_2-$	Hydrophobic
Serine	Ser	S	$-CH_2OH$	Polar
Threonine	Thr	T	$-CH(OH)CH_3$	Polar
Tryptophan	Trp	W	$-CH_2C_8H_6N$	Polar, aromatic, hydrophobic
Tyrosine	Tyr	Y	$-CH_2-C_6H_4OH$	Polar, aromatic, hydrophobic
Valine	Val	V	$-CH(CH_3)_2$	Hydrophobic, aliphatic

Type I *Ovis aries* (K33b)

N-terminus
MSYNFCLPNLSF**R**SSCSS**R**PCVPSSCCGTTLPGACNIPANVGSCNWFCEGSFNGNE
[1A](L1)[1B
KETMQFLND**R**LASYLE**K**V**R**QLE**R**ENAELES**R**ILE**R**SQQQEPLVCPNYQSYF**R**TIEELQQ**K**ILAN**K**AENA**R**LVVQIDNA**K**LAADDF**R**T**K**YQTELGL**R**QLVESDLNGL**R**
](L12)[2A](L2)[
RILDELTLC**K**SDLEAQVESL**K**EELICL**K**QNHEQEVNTL**R**SQLGD**R**LNVEVDAAPTVDLN**R**VLNET**R**AQYEALVETN**RR**DVEEWYI**R**QTEELN**K**QVVSSSEQLQSYQ
2B]
AEIIEL**RR**TVNALEVELQAQHNL**R**DSLENTLTETEA**R**YSCQLSQVQSLIVNVESQLAEI**R**SDLE**R**QNQEYQVLLDV**R**A**R**LESEINTY**R**GLLDSEDT**K**L

PCNPCATTNASSVGSYVTNPCTPCGP**R**S**R**FGPCNTSGC
C-terminus

Type II *Ovis aries* (K83)

N-terminus
MTCGFSTVGSGFGS**R**AFSCVSACGP**R**PG**R**CCITAAPY**R**GISCY**R**GLTGGFGS**R**SVCGGF**R**AGSCG**R**SFGY**R**SGGVCGPSPPCITTVSVNESLLTPLNLEIDPNAQCV**K**Q
EE
[1A](L1)[1B
KEQI**K**CLNN**R**FAAFID**K**V**R**FLEQQN**K**LLET**K**LQFFQN**R**QCCESNLEPLFEGYIETL**RR**EAECVEADSG**R**LSSELNHVQEVLEGY**KKK**YEEEVAL**R**ATAENEFVAL**K**
](L12)[2A](L2)[
KDVDCAYV**RK**SDLEANSEALIQEIDFL**RR**LYEEEI**R**VLQANISDTSVIV**K**MDNS**R**DLNMDCIVAEI**K**AQYDDIAS**R**S**R**AEAESWY**R**S**K**CEEI**K**ATVI**R**HGETL**RR**T**K**
2B]
EEINELN**R**VIQ**R**LTAEVENA**K**CQNS**K**LEAAVTQAEQQGEVALNDA**R**C**K**LAGLEEALQ**K**A**K**QDMACLL**K**EYQEVMNS**K**LGLDIEIATY**RR**LLEGEEQ**R**L

CEGVGAVNVCVSSS**R**GGVVCGDLCVSGS**R**PVTGSVCSAPCSGNLAVSTGLCAPCGQLNTTCGGGSCSLG**R**C
C-terminus

Figure 1. Type I and type II keratins from *Ovis aries* (sheep), showing α-helical chains 1A, 1B, 2A, and 2B (red), linkers L1, L12, and L2, and C- and N-termini (black) [13].

ubiquitous fiber since the domestication of sheep thousands of years ago. Through breeding, sheep hair has developed into fine wool with a high amount of crimp that facilitates spinning of the fiber into threads. Other animals commonly used for their wool are goats (cashmere and mohair), alpaca and other camelids, and angora rabbits.

Alpha-keratin and keratin-associated proteins

Mammalian hair has three structural elements: the outer layer made of cuticle cells that overlap to create a scale pattern used for microscopic identification, the cortex made of macrofibrils and, for some species, a medulla at the core of the fiber. In sheep wool, the cortex, whose macrofibril architecture defines crimp and coarseness of fibers, is organized into three cell types: paracortex, orthocortex, and mesocortex [21-22]. The macrofibrils are composed of intermediate filaments (IFs) of trichocyte keratins arranged longitudinally, cross-linked to structurally irregular keratin-associated proteins (KAPs) that compose the matrix surrounding the IFs [23]. The keratins form a large family of proteins of acidic type Is (K31 to K40) and neutral-basic type IIs (K81 to K87), of about 400 to 500 amino acid residues. The central rod domain is a right-handed alpha-helix (segments 1A, 1B, 2A and 2B in Figure 1) interrupted by some amorphous segments called linkers (L1, L12 and L2), and terminated by a long amorphous head and tail (N-terminus and C-terminus). The keratins assemble in coiled-coil heterodimers consisting of one type I and one type II proteins. Examples of sheep type I and type II proteins are given Figure 1, with the red segments indicating the alpha-helical structures. The KAPs consist of an even larger group of proteins (for example 23 families in sheep [24]) falling into three main categories: high-sulfur (HSPs), ultra-high-sulfur (UHSPs) and high glycine-tyrosine (HGTPs) proteins [24]. The hair keratins have a high content of the sulfur-containing amino acid cysteine, forming abundant cross-links (disulfide bridges) between the keratins' head and tail domains and the KAPs. Inter- and intra-molecular crosslinks of KAPs are also possible [23]. Through interactions with the keratins, the KAPs affect the mechanical properties of the fibers [24]. Both the macrofibril arrangement and the protein profile vary from species to species, implying that protein composition and expression influence fiber morphology and consequently their physical properties [25].

Skin, hide, leather, gut: collagenous proteins

Introduction

Clothing made from animal skins is present in the archaeological record in the form of hides, leather or furs (skins with hair still attached, see *Hair, wool and fur*). They were made into capes and cloaks, trousers, shoes, belts, and gloves, providing protection against cold, wind, and physical harm [26]. Once the skin is removed from the animal, it goes through a series of treatments to remove both the remaining fat and flesh on the internal side and the hair on the external side. One common method for dehairing is liming, an alkaline process that loosens the hair from the epidermis but also denatures and hydrolyzes keratins. After defleshing and de-hairing, the result is a raw hide that can be left untanned or turned into leather using one of several tanning or tawing methods: vegetable, chrome, alum, emulsified oils (often animal brain), or

fish oils (chamois leather). The tanning process generates cross-linking between the collagen fibers and in some cases bonding with the tannin molecules [18], and makes the skins more flexible and resistant to putrefaction.

Collagen is the main component of hides and leather and is also the main protein group found in gut and sinew used in garments in the Arctic parts of the world [10]. Leather, parchment and gut tissues have also been indirectly used in textiles, for example in metal threads made of metal-coated organic substrates (see *Complex samples: example of organic metal threads*).

Collagen proteins

Collagen fibrils consist of bound tropocollagen proteins, themselves assembled from three left-handed helical polypeptide chains. The three helical chains are twisted together and stabilized by hydrogen bonds to form a right-handed triple helix. There are 28 types of collagen, of which the most abundant type in skin and bone is type I collagen, made of a triple helix of two identical alpha chains α1(I) and one α2(I) chain [18]. Collagen has a very repetitive pattern with abundant proline (Pro) and hydroxyproline (Hyp), and one amino acid, glycine, occurring every three residues in a Gly-X-X pattern. The small size of Gly (the simplest amino acid, Table 1) allows it to fit into the helical structure stabilized by Pro and Hyp.

Silk

Introduction

Silk is an extracellular proteinaceous fiber reeled from the cocoon of silkworms. It is primarily produced from the domesticated silkworm *Bombyx mori* but other species have been exploited and are referred to as wild silks (for example Tussah, Muga or Eri silk). The reeled fiber is made of two brins of highly crystalline and insoluble proteins, the fibroins. In cross-sections, *B. mori's* brins appear triangular while the fibers from wild silk such as *Antheraea sp.* take an elongated oval shape [18]. The fibroins are glued with sericin, a randomized amorphous coil with a high content of the amino acid serine (for example 32 % in *Bombyx mori*), making it highly soluble. Sericin makes up 20-30 % of silk but is partially or completely removed for the production of threads in a process called degumming.

Sericin and fibroins

The composition [27] and structure [28-29] of silk have been well characterized, facilitated by the full sequencing of the *B. mori* genome in 2004 [30-31]. The main proteins of the silk, the fibroins, come in two forms: the light (L-chain) and the heavy (H-chain) chains. In *B. mori* the L-chain is a short protein with 262 residues, while the H-chain is a very long protein of 5263 residues made of many repetitive fragments. The high crystallinity and therefore strength of silk is due to the presence in the H-chain of residues with small side-chains, glycine (46 %), alanine (30 %) and serine (12 %), forming the hexapeptide repeat Gly–Ala– Gly–Ala–Gly–Ser (GAGAGS). The tyrosine(Y)-containing blocks (such as GAGAGY or GAGAGVGY) form semicrystalline regions. The H-chain is thus made of 12 hydrophobic crystalline regions (GAGAGS/GY-$(X)_n$-GY) separated by 11 amorphous hydrophilic regions (GT-$(X)_n$-GT) containing residues with large side-chains [32-33], and hydrophilic head and tail regions [28]. These amorphous regions form turns resulting in an antiparallel β-pleated sheet secondary structure [29] where protein chains are held together by noncovalent interactions, notably hydrogen bonding [18]. The H-chain is linked to the small globular L-chain fibroin by a disulfide bridge between Cys-20 (H-chain) and Cys-172 (L-chain) [33-34]. Finally, a glycoprotein (fibrohexamerin P25) completes the fibroin structural arrangement, incorporated once in every six H-chain-L-chain dimers through hydrophobic interactions [35]. The role of the glycosylated protein is to maintain the structure of the H–L unit, preventing denaturation [36].

Others: feathers, baleen, quills, sea silk

Alpha-keratin is the primary component of hair, but also of horn, hoof, baleen, quill and nail. Baleen was historically in great demand from the 17th to the 19th centuries as a support element in dresses, skirts and corsets. Recently the peptide mass fingerprinting method was applied to baleen from ten different species of whales and molecular markers were determined for each species, including species-specific markers [37]. The technique could be used to determine the source of baleen in historical clothing. Other hard tissues sometimes used as elements of clothing (feathers, reptilian skin, beak, and claws from birds) are mainly made of beta-keratin, a type of protein that differs from alpha-keratins in both primary and secondary structure. More unusual and rare are threads produced from man-made fibers (e.g. from milk proteins [38]) or from byssus, the sea silk from mollusks [39]. Despite its name, the sea silk, which comes from the byssus threads from *Pinna nobilis*, has no relation with the traditional silk from silkmoths. Because collagen has been identified in other byssal threads from marine mollusks (Mytilidae family), it was believed that the byssus from *P. nobilis* was also collagenous. A recent study has however demonstrated, using microscopy and amino acids analysis, that it was not the case [40].

Proteomics and applications to historical textiles

Proteomics: basic principles and techniques

Sample preparation: in-solution and in-gel digestions.

Fibrous proteins have low solubility in water. Using a variety of buffer solutions, depending on the major

proteins present or suspected, proteins are extracted (or solubilized) from their original sample or tissue and denatured (i.e. disruption of the secondary and tertiary structures).

Wool and hair are efficiently extracted with a high concentrated solution of urea with a pH>8.0 [41]; the disulfide bridges between cysteine's side chains are cleaved with a reducing agent, for example DTT (1,4-Dithiothreitol) or TCEP-HCl (Tris(2-carboxyethyl) phosphine hydrochloride), and reoxidation is prevented by alkylation, usually using iodoacetamide (the resulting carbamidomethylation adds a + 57.0214 Da to each cysteine). Proteins from collagenous objects made from skin and gut tissues have often been extracted using a simple solution of ammonium bicarbonate [9, 10, 42], although solutions based on guanidine [8] and urea (unpublished data) have shown good efficiency too. The filter-aided sample preparation (FASP) method based on the anionic surfactant sodium dodecyl sulfate (SDS) buffer and ultra-filtration has also been used on ancient leather [9], but has not yet been adapted widely on ancient textiles. Silk is insoluble in water due to the compact beta-sheet arrangement of the H-chain and does not easily denature in any common protein extraction buffer. Because silk dissolves in concentrated organic salt solutions, a common method for dissolution is to use an aqueous calcium chloride–ethanol ($CaCl_2$ / EtOH /H_2O) system heated at high temperature [12].

Proteins are then digested by a proteolytic enzyme (usually trypsin) that cleaves proteins at the C-terminal side of arginine (R) and lysine (K) residues; the resulting peptides are usually short fragments of up to 20-30 residues. For silk however, the common enzymatic digestion with trypsin is inefficient on the H-chain because it has no arginine and lysine residues for trypsin digestion in the beta-sheet regions. Trypsin can only be employed for the head and tail domains, or to digest sericin, L-chain fibroin and P25. Instead, digestion of silk is best performed with chymotrypsin, which has high-proteolytic specificity in cleaving peptide bonds at the C-terminal side of tyrosine, tryptophan and phenylalanine, and to some extent leucine, methionine, alanine and aspartic and glutamic acids. Chymotrypsin is best suited for the digestive generation of peptides from the heavy chain of silk fibroin, which is particularly rich in tyrosine.

Digestion is performed either in-solution (some methods of fractionation including strong and weak ion exchange, reverse-phase and size-exclusion chromatography can be employed prior to digestion [43], in which case the fractions are digested separately), or proteins are separated by one (1D) or two dimension (2D) gel electrophoresis and digested from the bands or spots formed on the gels (in-gel digestion). The common 1D separation technique is sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) that uses SDS to denature proteins and a polyacrylamide discontinuous gel as separation medium [44]. Upon application of an electric field, the proteins migrate down a lane at various speeds and are separated by their molecular weight. In 2D gels, proteins are first separated linearly in the first dimension by their isoelectric point (pI), before being separated at 90 degrees by their molecular weight. The first dimension is called isoelectric focusing (IEF); protein separation operates on an immobilized pH gradient gel where an electric potential is applied across the gel. The proteins migrate toward the cathode (negatively charged) and are focused in the pH region corresponding to their pI (point of neutral charge of the protein). For the second dimension, the strip is treated with SDS for denaturation of the proteins and loaded onto an SDS-PAGE gel for separation by molecular weight. The result is a complex 2D map of proteins. In both 1D and 2D gels, proteins must be revealed by gel staining (e.g. Coomassie or silver staining), thus appearing as darker spots or bands that can be further excised and processed for in-gel digestion. Gel-electrophoresis techniques are more time-consuming than in-solution digestion but are advantageous for complex samples that require fractionation as the dynamic range of mass spectrometers is limited [43]: they are used to separate major from minor (low-abundance) proteins of proteomes (e.g. wool [41]), and specific proteins can be analyzed rather than the whole sample.

Mass Spectrometric analysis.

There is a large range of mass spectrometric techniques that can be applied to proteomics studies. In mass spectrometry, molecules are ionized and identified by means of their mass-to-charge ratios (*m/z*). The resulting mass spectra are plots of the relative abundance of ions as a function of their *m/z* values. In MS mode, peptides are identified by their mass only; in MS/MS mode, a peptide is selected, isolated and fragmented in a collision cell, and the resulting fragments are acquired by a mass analyzer to form a spectrum that will be read as the amino-acid sequence of the peptide. The mass spectra generated are compared with protein sequences in databases.

The most common methods of ionization are matrix-assisted laser desorption ionization (MALDI) and electrospray ionization (ESI) [45]. In MALDI, gas-phase ions are formed when molecules mixed with a matrix are irradiated with a laser; the matrix absorbs the laser energy and instigates ionization of molecules as singly-charged ions. MALDI is often coupled with a time-of-flight mass spectrometer (TOF-MS) in which the ions are accelerated through a fixed electric field and their time of flight to reach the detector determine their mass-to-charge ratio (heavier ions travel slower). With this mode of analysis, samples are directly deposited on the MALDI plate and mixed with the matrix (typically 1 μL of analyte with 1 μL of matrix such as α-cyano-4-hydroxycinnamic acid). Most abundant or most easily ionized peptides are detected in a single mass spectrum [45], and MALDI-TOF-MS is

therefore the method used in peptide mass fingerprinting (see *Peptide Mass Fingerprinting (PMF) for the application to animal hair*) for taxonomic identification of specimens [14, 45]. Peptides can also be fragmented and identified in tandem MS mode (MALDI-TOF/TOF-MS). In ESI, the analyte is mixed with a solvent and injected through a tip, high voltage is applied to the sample which is dispersed in a spray and ions are created through desolvation (evaporation of the solvent). ESI is used for LC-MS/MS: the peptide solution (obtained from either in-solution digestion or in-gel digestion) is injected into a High Performance Liquid Chromatography (HPLC) or Ultra Performance Liquid Chromatography (UPLC) system for separation. For proteomics, the LC system is equipped with a reverse-phase column as the stationary phase and the mobile phase is a gradient of water miscible organic solvent (acetonitrile) with acidified water (e.g. 0.1 % formic acid). Peptides are separated on the column by their hydrophobicity and transferred to the mass spectrometer through the ESI source. Mass spectrometers used with ESI are, for example, quadrupole-TOF instruments or Orbitraps [45]. ESI-LC-MS/MS allows characterization of more complex samples than MALDI-TOF and as such is preferred for studying degradation in ancient samples or for separation of complex protein samples.

Characterization of proteins and species identification

Peptide Mass Fingerprinting (PMF) for the application to animal hair

For wool and hair fibers, species identification in ancient textiles is most often based upon the species-specific pattern of the overlapping scales forming the cuticle and the diameter of fibers [46]. Using a range of microscopic techniques, the features of hair (fiber's diameter, shape and size of the scales of the cuticle, presence of medulla and its pattern) are recorded [47]. The task is painstaking and requires intense expertise and experience, as well as a large bank of references to account for inter- and intra-species variations [48]. Microscopic identification is further limited by variations between breeds, sometimes even in the fleece itself, and by the degradation of the cuticle, especially in archaeological artefacts. Other techniques have been considered for species identification of animal fibers such as DNA analysis [49] and Fourier Transform Infrared Spectroscopy FTIR [50]. The development of these techniques is often driven by commercial applications: luxurious fibers in textiles such as cashmere have an important economic value but problems of adulteration with lower-value fibers have called for accurate

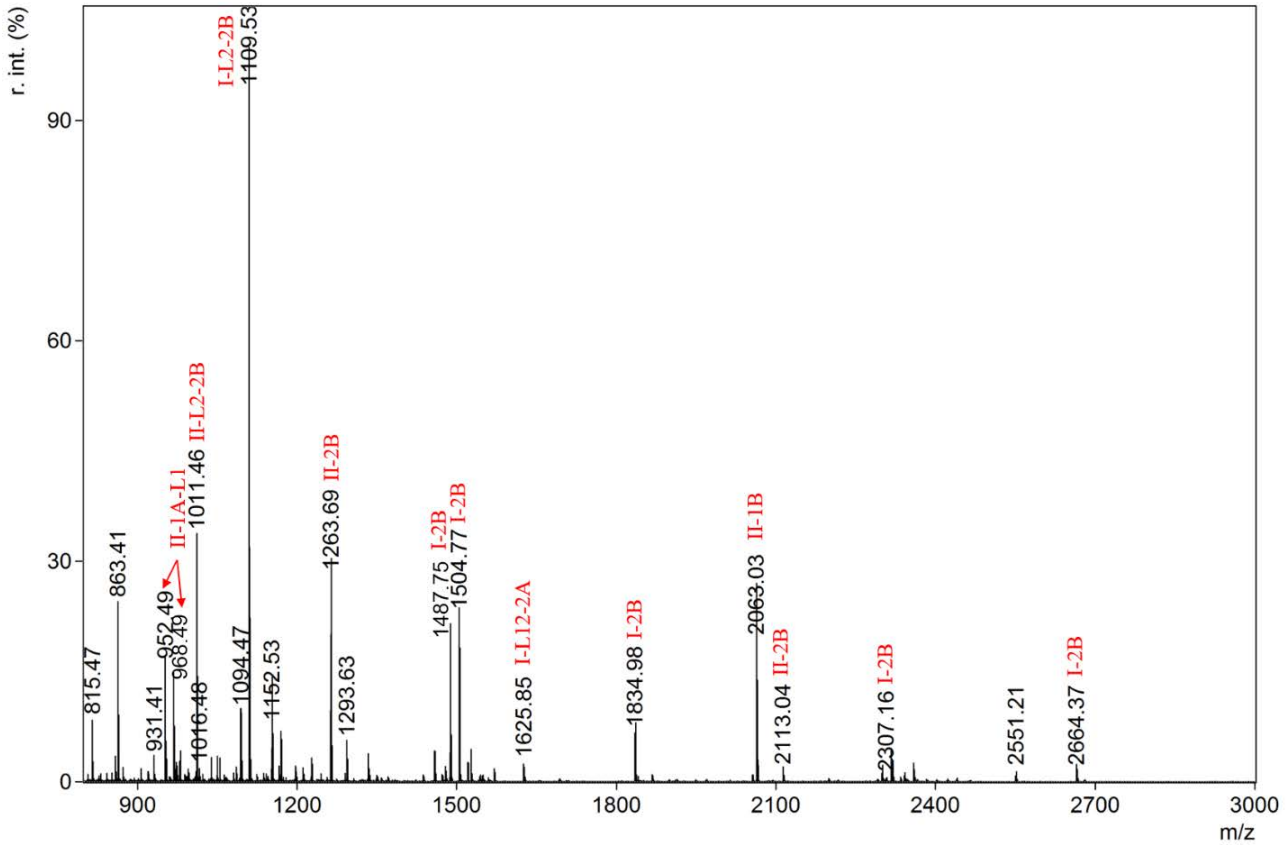


Figure 2. Merino sheep PMF obtained by MALDI-TOF-MS, showing peaks corresponding to peptides classified by their positions on the keratin sequences (Figure 1).

Table 2
Selection of markers for species identification in a few species. Peptide *m/z* values are indicated with carbamidomethylation on cysteine (cysteine alkylated with iodoacetamide). For full results, additional species, and description of the peptides, see Solazzo [16, 17, 37].

Peptide	Human	Sheep	Goat	Cow	Alpaca	Dog	Bear	Beaver	Baleen (bowhead)	Opossum
I-L12_2A	1625.85	1625.85	1625.85	1625.85	1625.85	1625.85	1625.85	1625.85	1655.82	1669.87
I-2B	1848.99	1834.98	1834.98	1834.98	1834.98	1848.99	1848.99	1848.99	1843.95	1848.99
I-2B	2307.18	2307.18	2307.18	2307.18	2258.16	2305.13	2319.15	2307.18		2318.20
I-2B	2593.35	2664.37	2691.36	2576.31	2583.35	2592.29	2636.33	2638.30	2664.37	2728.35
II-1A_L1	968.49	952.50/ 968.49	952.50/ 968.49	968.49	968.49	1041.49	1041.49	1041.49	1041.49	1041.49
II-1B	2007.99/ 2136.09	2063.03/ 2191.12	2063.03/ 2191.12	2063.03/ 2191.12	2063.03/ 2191.12	2035.98/ 2164.08	2035.98/ 2164.08	2035.00/ 2163.09	2063.03/ 2191.12	2035.00/ 2163.09
II-2B	2043.99	2113.05	2113.05	2113.05	2101.02	2072.02	2088.02	2071.99/ 2088.02		2101.02
II-2B	1263.69	1263.69	1263.69	1263.69	1263.69	1263.69	1263.69	1263.69	1263.69	1235.69

methods for the identification and quantitation of hair fibers. Towards this goal, methodologies based on quantitative proteomics have also been developed [51-52]. For ancient textiles, DNA and FTIR are of limited interest: FTIR spectroscopy lacks specificity [50], while DNA recovery is generally inadequate in wool and may be further hampered by alterations due to degradation of the wool, dyes and burial conditions [53]. Recently immunological techniques using enzyme-linked immunosorbent assay (ELISA) and immuno-fluorescence microscopy have been applied to both ancient wool [54-55] and silk [56-58].

Peptide mass fingerprinting for species identification relies on matching the peptidic profile of the unknown sample with a set of reference spectra, and if possible, on the identification of specific markers. The peptidic profile is a mass spectrum of peptides obtained from enzymatic digestion of proteins and identified by their mass-to-charge ratios (*m/z*), usually using MALDI-TOF-MS. For animal hair, keratins (more abundant in hair than the KAPs) are predominantly identified on PMFs. The spectrum in Figure 2 shows some of the main peptides identified in sheep wool and classified by their positions in the sheep sequences (Figure 1). Some peaks are shared among multiple species, while some, such as the peptide at *m/z* 2664, is specific to the Ovis genus (Table 2), as well as in some baleen whales [37].

Using key markers, identification can be achieved in archaeological samples, preferably based on the detection of multiple markers, as ancient samples tend to have altered profiles compared to their modern references. Some markers can be absent, while some might contain modifications (e.g. oxidation, deamidation) that change the mass of the peptide. For these reasons, it is advantageous to use markers with known sequences, to be able to account to possible modifications. Figure 3 compares an unknown archaeological sample to the modern reference sample of black bear. While identification is possible at the genus level (bear), the archaeological profile is altered compared to the modern sample, in particular there is a loss of intensity in the peaks and increase in background noise. This reflects the degradation of the ancient sample, mostly from hydrolysis of the protein chains into shorter fragments.

PMF was first applied to ancient textiles and garments in the early study of the clothing of the Iceman Oetzi [5, 59]. Multiple animal species (such as sheep, goat, red deer) were found by analyzing the hair of different fur elements of clothing. Woolen textiles and hair have also been successfully identified when preserved in contact with copper artifacts [60], or in peat bog [7]. PMF has also been applied to collagenous tissues to identify Arctic clothing made of skin and gut tissues [10], as well as skin garments from Danish bogs [9].

Often PMF is enough to determine the origin of a material, as long as it is made of a simple substrate. If multiple proteinaceous tissues or species are used, PMF would result in incomplete profiles, often dominated by the major component. Complex substrates need to be analyzed after separation of the peptides. In a study of Coast Salish blankets, for example, a combination of MALDI-TOF/TOF-MS and nanoLC-ESI-MS/MS was used to identify dog hair mixed with mountain goat hair in the yarns of woven textiles [6]. Currently, proteomics based on nanoLC-ESI-MS/MS is being implemented at the Museum Conservation Institute for the characterization of the protein composition of organic metal threads, with a first study successfully identifying the bovine origin of a membrane thread from a 14th c. textile [8].

Complex samples: example of organic metal threads

Metal threads used in textiles exist in single strip and wire forms or as metal-wrapped threads when wound

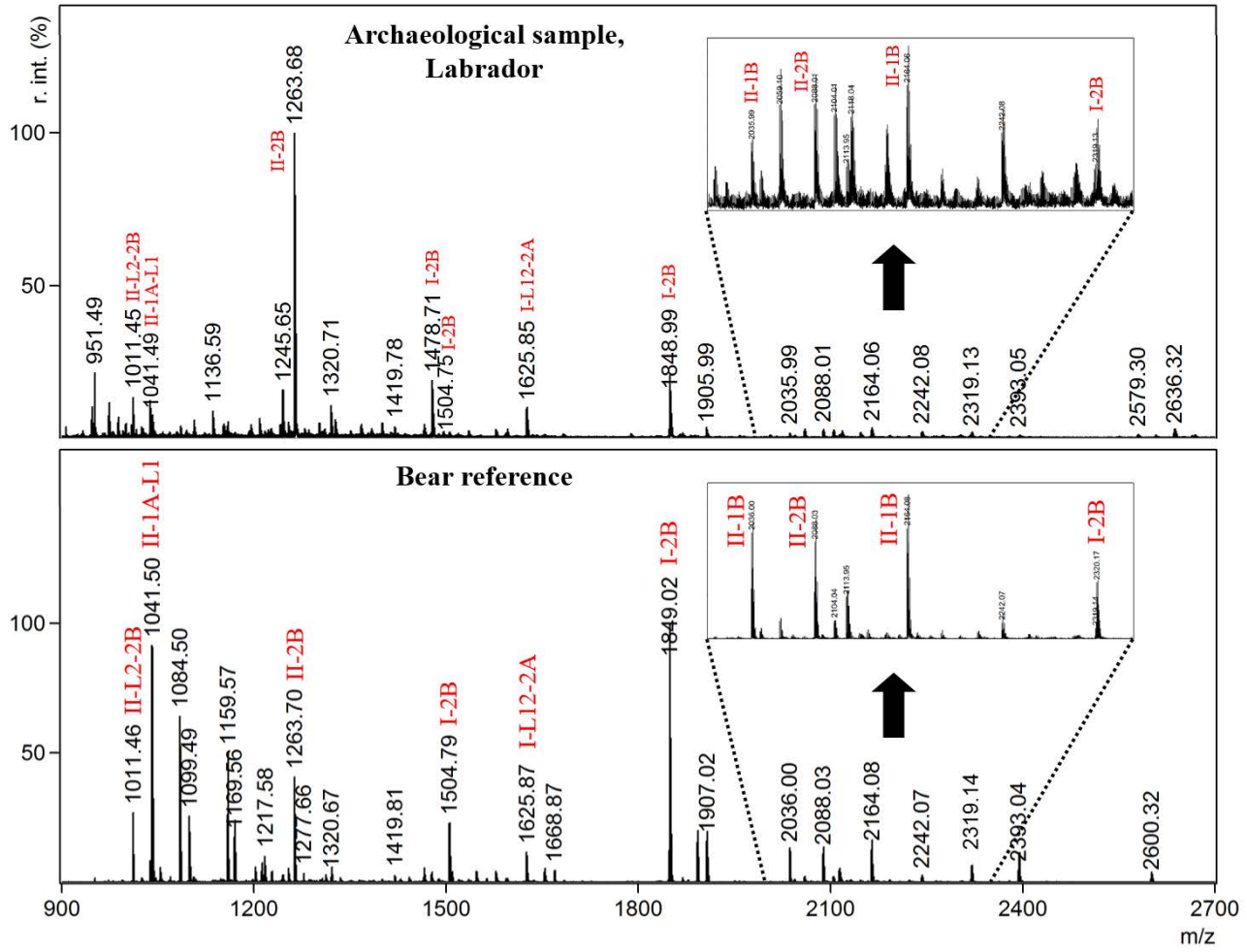


Figure 3. An archaeological sample from Labrador (top) compared to the reference sample of black bear (bottom) with all peaks allowing identification to the species.

around a fiber core (for example silk, linen) [61]. Some metal threads were made with an organic substrate, either cellulosic (paper) or proteinaceous (leather, parchment or membranous tissues, often the stomach or intestinal walls of animals), the latter type often referred to as membrane metal threads. These threads were popular since, necessitating less metal to be made, they were more economical and lightweight [62]. The metal (most frequently gold, silver or alloys of gold and silver) was applied on the organic substrate using either an additional adhesive (bole, glue, gum, or eggs) or the natural exudates of the substrate [63]. The metal-coated substrate was then cut into thin strips, used as such or wound around a core yarn.

Membrane metal threads were made and/or used in many localities, from Europe to the Middle East, to Central and East Asia, for most of the medieval period, and possibly beyond that. For instance, metal threads made on leather were still used in the construction of Chinese Children hats from the turn of the 20th c. (unpublished data, and [64]). Metal-coated leather threads might have arrived from the Far East as early as the 10th c. in Europe and lasted until the 16th c [61]. Membrane threads are believed to have appeared around the 11-12th c. and originated from Byzantium, or on/through the island of Cyprus, subsequently being referred as "Cyprian gold thread" (or "Cyprus gold") [62, 65]. From Southern Europe, membrane metal threads spread north to Italy, Germany and other countries, but there has been much speculation about whether the threads were imported or their production was established in European workshops and if so, when and where. Supposedly, the threads from Cyprus were of finer quality than the ones from European workshops [65].

Járó et al. [65] examined gilt membrane threads in order to categorized them by location and date. In their study from 1988, the width of the strips was measured in over 40 membrane threads from Italy, Germany and Hungary, and ranged from 0.30 mm to 1.30 mm. The narrowest strips were generally found in weavings from the 14th c. or younger, while the widest belonged to embroideries and weavings from the 14-15th c. A comprehensive description of the different elements (the types of substrates and adhesives) composing the organic metal threads was also provided by Indictor et al. [63]. Since then, however, most analytical research has focused on the analysis of the metal composition and layering to

detect patterns relevant to geographical origin, but little has been done to identify the organic substrates.

Proteomics is an ideal method to study these types of metal threads. Using less than 0.1 mg of thread, proteolytic digestion can separate and identify the different proteins from both the substrate and the adhesive. Our pilot study [8] showed that an egg-based adhesive can be identified in addition to the proteins from the substrate, which, in the case of parchment, leather or abdominal and intestinal membranes, is dominated by collagen proteins. An animal glue adhesive, on the other hand, might not be identified if it originates from the same species as the substrate. In the presence of a paper substrate, a proteinaceous adhesive would be completely characterized, regardless if it is egg-based or collagen glue. Table 3 shows the main proteins identified in different collagen-based substrates. Proteomics analysis of leather indicates that de-hairing and tanning treatments not only removes the keratins from hair and the epidermis but also minor proteins such as proteoglycans and elastin [66]. In archaeological leather, mainly collagen has been detected [9].

Proteome characterization of domesticated vs wild species

Proteome characterization of silk

Most silks used in textiles belong to the bombycidae and saturniidae families. Both families contain hundreds of species, but bombycidae is best known for the *Bombyx mori* domesticated silk moth, also known as the true silk moth. *B. mori* was domesticated from the Chinese stock of its wild relative, *B. mandarina* that is found from North India to Japan and Russia [67]. Among the saturniidae (and saturniinae subfamily) are the giant silk moths such as the tussar moths from the Antheraea genus and the Eri silkmoth from *Samia cynthia*.

While proteomics has been applied to identify silk in ancient burials [68-69], the question of differentiating domesticated from wild silk in archaeological textiles is dependent on the availability of sequences (see Table 4). The H-chain fibroin sequences from some wild silk species are now known but in certain species the light-chain fibroin and P25 proteins have not been detected: instead the fibroin might be formed by two polypeptides of similar size linked by a disulfide bridge (personal communication Boyoung Lee). Full sequencing of H-chain fibroin of *B. mandarina* however would also be required to determine sequence differences with *B. mori* and look for early traces of domestication in ancient textiles. Sequences available for the shorter proteins show a high degree of homogeny with *B. mori* (NCBI Blast alignment): 99 % with fibrohexamerin (a variation of two residues out of 220) and 100 % with L-chain fibroin (protein of 262 residues in length). The one protein of sericin available in *B. mandarina* (sericin 1A; 722 residues long) is 98 % similar with *B. mori* (for a variation of 17 amino acids).

In a recent study [70], physical properties of some silkworm silks were correlated with the amino acid sequences of H-chain fibroins, comparing *B. mori* to Saturniidae species, including *Samia cynthia ricini* and *Antheraea* sp. for which heavy chain fibroins have been sequenced (Table 4). The primary structure (or amino acid sequence) of the domesticated and wild silks differs widely, first in the number of residues (H-chain of *B. mori* is almost twice as long as the Saturniidae species that have between 2639 residues for *A. pernyi* and 2880 for *S. ricini*), and secondly in the composition of the amino acid domains [18]. While *B. mori*'s H-chain is made of crystalline and semi-crystalline repeats of (GA) nGX (where X is S, Y or V) [70], the Saturniidae species alternate blocks of 12-13 contiguous alanine residues with glycine-rich regions (GX, GGX and GGGX repeats). The alanine blocks were found to correlate with better thermal stability and strength, while more bulky hydrophobic residues correlate to higher brittleness but better extensibility [18, 70]. Other properties of silks (e.g. susceptibility to photo-oxidation) and how they might influence preservation of ancient textiles could also be better addressed with characterization of the sequences.

Table 3
Summary of proteins identified in skin and intestine tissues after extraction with urea buffer, reduction, alkylation, and trypsin digestion. In bold are the major proteins identified (based on the percentage of the protein sequence identified).

	Collagens	Proteoglycans	Cytoskeletal proteins	Smooth muscles proteins
Rawhide	**α1(I)**, **α2(I)**, α1(II), **α1(III)**, α2(V), α2(VI), α3(VI), α5(VI), α1(VII)	Lumican, Decorin, asporin	Beta-actin, vimentin, tubulin	Alpha-actin, Myosin 11, transgelin
Parchment	**α1(I)**, **α2(I)**, α1(II), **α1(III)**, α2(V), α1(VI), α2(VI), α3(VI)	Lumican, Decorin,	Beta-actin	
Leather	**α1(I)**, **α2(I)**, **α1(III)**, α2(V), α3(V), α3(VI)		Tubulin	
Membrane (intestine)	**α1(I)**, **α2(I)**, α1(II), **α1(III)**, α1(IV), α2(IV), α1(V), α2(V), α2(VI), α3(VI), α1(VI), α1(XIV)	Decorin, Heparan sulfate, mimecan, lumican	**Filamin**, **actin**, talin, synemin, vinculin, tubulin, vimentin,	**Myosin 11**, **myosin 2**, **myosin 6**, **desmin**, **calponin**, myosin 9, myosin 12B, alpha actinin, transgelin, tropomyosin

Table 4
Known sequences of silk proteins in domesticated and wild silks (✓ indicates at least one record exists and × that no sequence is available)

Sequences in NCBI	*Bombyx mori* (Domestic silk)	*Bombyx mandarina* (Wild silkmoth)	*Samia cynthia ricini* (Eri silk)	*Antheraea pernyi* (Tussah silk)	*Antheraea assamensis* (Muga silk)	*Antheraea yamamai* (Tensan silk)
Fibroin heavy chain Fib-H	✓	×	✓	✓	✓	✓
Fibroin light chain Fib-L	✓	✓	×	×	×	×
Sericin	✓	✓	×	×	×	×
P25	✓	✓	×	×	×	×

Proteome characterization of sheep wool

European sheep is descended from the Asiatic mouflon and was domesticated about 10,000 years ago in the Middle-East [71]. Through selection, certain valuable traits appeared (e.g. decrease of natural shedding, white-colored coat) [71] and led to breeds dedicated to the production of wool. Mammals have two types of coats, an outer coat of coarse guard hairs providing mechanical protection and the inner coat of short and fine hair that provides thermal protection. Breeds selected for their fiber no longer have guard hairs but a single coat of fibers with similar physical characteristics [72]. Breeding also resulted in the development of finer wool, higher yield of wool and a wide range of wool varieties. The merino sheep, which was bred in Spain after the introduction in the 12th c. of sheep from North Africa, has some of the finest wool produced commercially today [73]. As in the past, the value of modern wool is grossly related to fiber diameter (finer fibers produce finer yarn), and to a lesser extend to other factors such as staple strength and length, crimp (waviness), and color. Changes in the types and qualities of wool available at different periods in different regions have been recorded both by historians researching documentary sources [73-74] and by archaeologists working on the excavated textiles [75-76] using the distribution of fiber diameters to classify medieval wool into seven different fleece types [77].

Wool is mainly protein; the types and relative proportions of different proteins in the wool fiber govern its properties, or phenotype. Ultimately, it is the proteome and not the genome that governs the quality of the wool. Proteomics can attempt both qualitative and quantitative comparisons of the protein composition of the wool fibers themselves. By using 2D-electrophoresis, the protein composition of wool is revealed on maps where keratins and KAPs are clustered in specific positions. In the high molecular mass region, a tight cluster of spots corresponding to acidic type I keratins is visible at low pH, while the type IIs appear as a long string of spots over a higher pH range [24]. The content of these proteins seems to vary little between breeds of sheep [78]. At lower molecular mass, and with lower intensities are scattered the spots corresponding to KAPs (Figure 4). Early research combining 2DE with MALDI-TOF has suggested that the high-sulfur KAPs (HSPs) may play a role in fiber curvature or crimp [79- 80]. In a study comparing Merino, Romney and Corriedale sheep, differences were observed in the KAP1 HSP family, with a pattern of spots significantly different for Merino [24, 78]. Figure 4 shows an increasing intensity of spots in the HSP region from mouflon to Merino (Soay, a feral type of sheep, is shown here as intermediary between wild sheep and merino wool). Differences are also apparent in the HGTP region with different sets of proteins present for

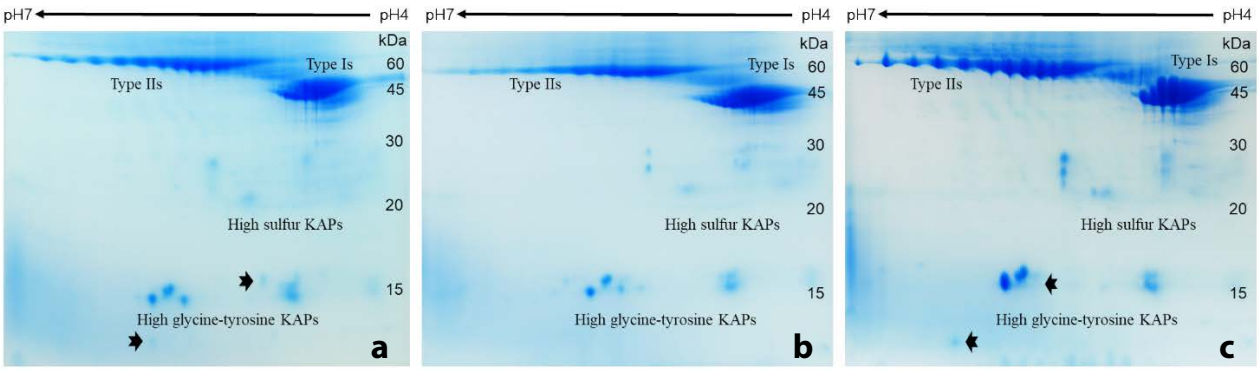


Figure 4. 2DE maps of *a)* mouflon, *b)* Soay sheep and *c)* Merino sheep (Caroline Solazzo, unpublished data).

each breed (arrows pointing to spots present or absent, Figure 4). HGTPs are found to be preferentially expressed in the orthocortex and an increase of these proteins may be related to decrease in crimp frequency [24].

Protein degradation in textiles

Textiles made from animal fibers are some of the most fragile artefacts to handle and preserve. Degradation might start during processing of the fibers as some of the treatments can be harsh to proteins. Frequent forms of degradation are protein chain breakage from hydrolysis and chemical modifications such as oxidation that can further make the protein chains susceptible to breakage. For archaeological textiles, deterioration is dependent on burial conditions (soil composition, pH, temperature, oxygen content, contact with wood coffins, metals, etc.), and on how these environmental factors regulate microbial activity. In wool, the presence of cystine, formed by disulfide bridges between cysteines, confers high resistance to chemical degradation. Keratins are therefore primarily degraded in soil via specialized keratinolytic microorganisms, as they produce enzymes capable of denaturing proteins and of breaking the disulfide bridges, necessary steps for proteolytic enzymes to access and attack keratin [11]. Wool, however, survives well in cold wet and hot arid environments, waterlogged soils, peat bogs and salt-saturated soils, when bacterial and fungal activity is reduced.

Even if physical damage is not directly observable, changes happen at the amino acid residue level and can still create long-term damage. Some studies have aimed at monitoring these changes to classify damage and anticipate the preservation of textiles. Physicochemical damage of wool and silk in indoor environments was assessed using dynamic mechanical thermal analysis (DMTA) together with thermogravimetry (TG) and differential scanning calorimetry (DSC) [81]. Cystine conversion into oxidation products such as cysteic acid in wool has been followed by attenuated total reflectance-Fourier transform infrared (ATR-FTIR) spectroscopy [82] and near infrared spectroscopy (NIR) [83]. Fibroin degradation in silk has been assessed by ATR-FTIR [84], NIR and High Performance Size Exclusion Chromatography (HPSEC) [85-86]. Assessment of oxidation through changes in amino acid composition has also been proposed using amino acid analysis [87]. In addition to these techniques, proteomics can be a powerful tool to determine precisely which amino acids are modified and/or which proteins or sections of proteins have been degraded [11]. Modifications to the fiber's chemical structure made after the fiber has been separated from the living animal can be specifically searched for by database search engines, or automatically identified through integrated searches (for example by using error tolerant) [3]. Two types of modifications occurring on animal fibers are presented here: deamidation and photo-oxidation.

Deamidation.

Protein deamidation, the process by which glutamine (Gln/Q) and asparagine (Asn/N) are converted into glutamic (Glu/E) and aspartic (Asp/D) acids (resulting in a mass shift of +0.984 Da, Figure 5), has been identified as an important biomolecular marker of the deterioration and natural aging of proteins in artistic and archeological materials [88-90]. Deamidation affects all protein fibers that contain glutamine and asparagine. In silk, less than 1 % of all amino acids residues in the H-chain fibroin are N and Q, and they are mostly located in the amorphous head and tail regions, in contrast to the L-chain where almost 13 % are N and Q, making this protein more amenable for deamidation studies. In collagen, glutamine has mostly been targeted in studies of bones because the turnover rate of glutaminyl residues is slower than that of asparaginyl residues [91]. Deamidation has been observed in a 200-year old skin kayak [10] but has not yet been studied in other skin garments. In hair's IF proteins, asparagine and glutamine are prevalent amino acids and constitute an important way to look at ageing and degradation of ancient wool and hair proteins. In sheep, for example, N and Q make up on average 14 % of the type I proteins and 10 % of the type IIs. Through the introduction of negative charges, deamidation creates extensive disruption on the three-dimensional structure, resulting in denaturation of the α-helices and eventually affecting the strength and appearance of textiles. Deamidation is influenced by pH and temperature, but other parameters such as humidity and the structural integrity of the protein also play a role. In a study on deamidation of wool [13], we demonstrated that deamidation in wool models was time-dependent in a controlled environment but rates of deamidation were influenced by primary structure (neighboring amino acids) as well as higher order structures of proteins (the alpha-helical structure), thus showing that peptides had very different rates of deamidation. On archaeological wool, the study highlighted the effect of the local environment and found that deamidation correlated poorly with age of samples. Predominance of deamidation on glutamine rather than asparagine in archeological wool samples was attributed to a higher abundance of Q in the α-helical core domain of keratins, neighboring residues and steric hindrance preventing deamidation of N. In acidic soils that favor wool preservation, direct hydrolytic deamidation of glutamine is thus facilitated [13]. In a subsequent study looking at deamidation in wool mineralized by copper ions, we found that the more mineralized the fabric was, the less deamidated it was, indicating that the presence of copper corrosion products inhibited deamidation. In non-mineralized samples, deamidation proceeded at a rate imposed by the local environment [60].

Photo-oxidation

Photodegradation is a major issue that affects textiles made of protein fibers such as wool and silk

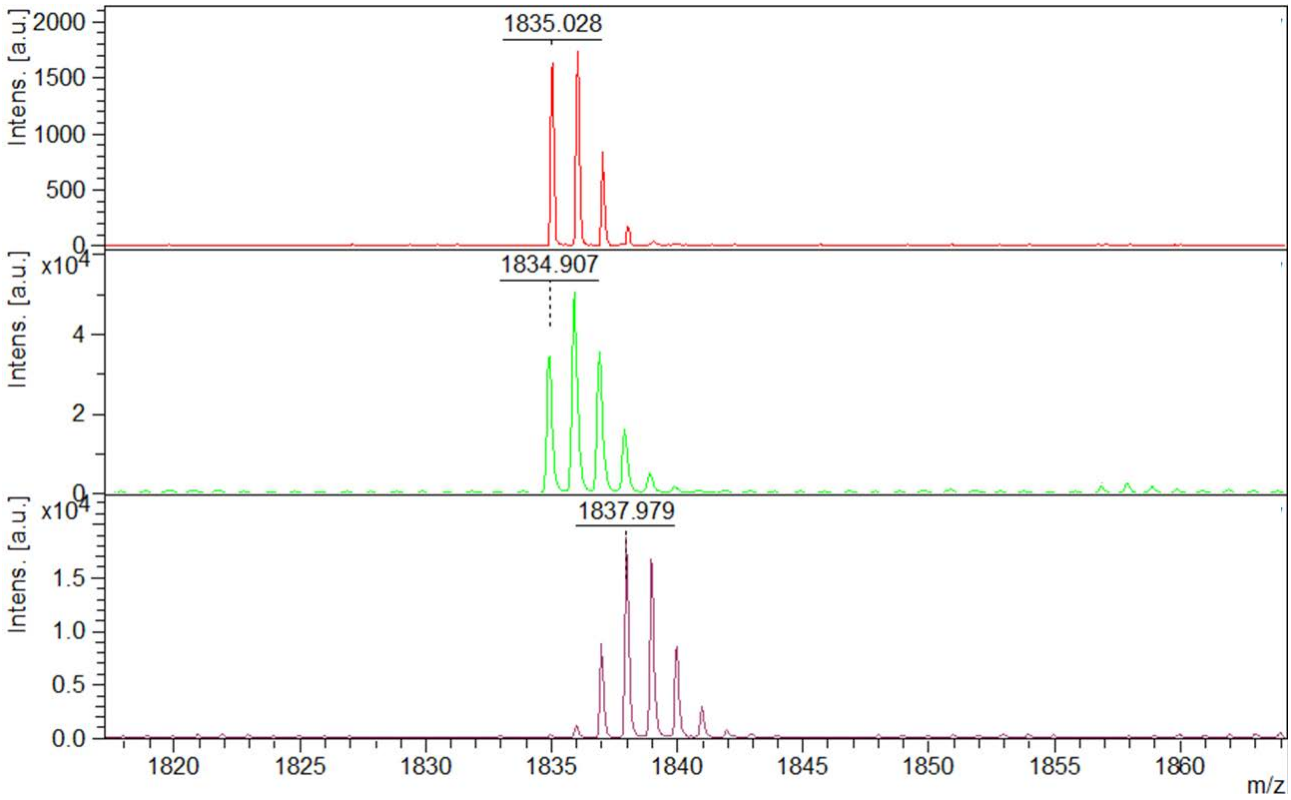


Figure 5. Deamidation of peptide *m/z* 1834.98 in modern sheep wool (top, no deamidation) and in archaeological samples, with low deamidation (middle) and high level of deamidation (bottom).

as they tend to discolor or yellow when exposed to UV light. Photodegradation not only leads to yellowing or alteration of the original color but also affects other physical properties of the fabric, such as strength and elasticity. In museums, preventive measures can be taken to mitigate the damage resulting from light exposure. However, understanding the mechanisms that lead to photodegradation of protein fibers can help to prevent further damage due to weakening of the protein chains from past exposure. Quantitative proteomics techniques could also help in better quantifying the damage and compare textiles or threads from within the same textile.

Photo-oxidation is initiated via radical species that react with atmospheric oxygen and produce peroxide radicals. Reactive oxygen species (ROS) attack both amino acid residue side-chains and the protein backbone itself. Photo-oxidative damage is caused by the accumulation of chemical modifications at the amino acid residue level that lead to a range of oxidation products, including chromophores responsible for changes in coloration. In addition, photodegradation leads to peptide chain scission, as well as reduction of disulfide bridges. In wool, cystine is oxidized, through the intermediate products sulfenic and sulfinic acids (both unstable), into cysteic acid, although other factors than UV light can contribute to cystine oxidation. Amino acid residues with aromatic side-chain groups (phenylalanine, tyrosine and tryptophan) are better markers of photo-oxidation due to the susceptibility of the aromatic groups to oxidation [92]. In archaeological wool, tryptophan and tyrosine are the main amino acids modified by photo-oxidation [93], while in silk photo-oxidation is directed mainly at tyrosine that is far more predominant (5 % of the H-chain fibroin) [12]. Both tryptophan and tyrosine are oxidized through a cascade reaction that starts at single oxidation [W + O] and [Y + O], followed by double oxidation [W + 2O] and [Y + 2O], to more complex products of oxidation and chromophores primarily responsible for yellowing, among them kynurenine [W + O - C] and hydroxykynurenine [W + 2O - C], and quinone [Y + O - 2H] and hydroxyquinone [Y + 2O - 2H] [92, 94]. Irradiation with UV light of undyed and unpigmented wool showed a gradual increase in oxidation products in keratins over a 48h exposure [93]. Similarly, for untreated silk proteomics data showed a sharp increase in the formation of quinone-based tyrosine derivatives after UV ageing that correlated well with an increase in yellowing and loss of tensile strength.

Not only the length and intensity of UV light exposure produce long-term damage, the treatment of fibers with dyes, mordants, or in the case of silk, weighting agents, can also influence photodegradation positively or negatively, either by improving the photostability of the wool or by increasing the level of phototendering resulting in loss of strength and flexibility. UV radiation is absorbed by dye molecules, resulting in dye chromophores being destroyed and fading. In wool for instance, more photo-oxidation was measured by proteomics on weld-dyed samples after 48 h of UV exposure than on madder-dyed samples, but

the addition of alum mordant to madder increased the photo-oxidation [93]. The presence of trace metals (for example iron and copper), that increases the production of hydroxyl radical, influences wool photostability and accelerates photoyellowing. In tin-weighted silk, more tyrosine oxidation was measured after UV exposure compared to unweighted silk, although when silk was treated with sodium tin(IV)aluminophosphosilicate derivatives, fewer peptides were observed, most likely from cross-linking, induced for example by the formation of dityrosine [12].

Conclusion

Since the introduction of proteomics to the characterization and identification of fibrous proteins, the technique has shown a promising future for the study of ancient textiles and garments. Current and future applications to archaeological and historical textiles may be further improved by: (1) the development of analytical techniques that include novel extraction protocols, sample minimization, and mass spectrometry and instrumental developments; (2) the growth of genomics data that rapidly populate databases with ever increasing numbers of organisms' proteomes; (3) the proteomics studies on modern textiles; and (4) better collaboration between archeometrists and historians and conservators, for whom proteomics facilities might be out of reach. While this review paper barely covers the wide field of textile's proteomics, it gives an overview of the type of research that has been accomplished or is applicable to ancient textiles and clothing. The challenges linked to the fragile state of fibrous proteins and rare recovery in archaeology can be overcome, using proteomics as a powerful and complementary methodology to other techniques.

Appendix: Guidelines for sampling of textiles for proteomics analysis

Handling of samples

Protein-based samples should be handled with non-latex gloves to avoid contamination. For wool and hair samples, it is particularly important to avoid touching the samples with bare hands, due to contamination from dead human skin. The cells of the epidermis are keratinized with epithelial or cytoskeletal keratins (cytokeratins). These keratins are alpha-keratin proteins , similar to the cuticular keratins of hair. For this reason, dead skin is a very common contaminant recognizable by the persistent keratin background in proteomics analysis. Although both types of keratins share common peptides, in proteomics searches, proteins specific to human skin can be filtered out and are easily differentiated from the cuticular keratins

Minimizing contamination from human keratins is however important when working with ancient samples, so that they do not overwhelm the signal from the ancient proteins. Cytoskeletal human keratins are unavoidable, as they can get into tubes, even during sample preparation. More problematic are keratins coming from hair contamination. This type of contamination can come from human hair, or from clothing made with wool (sheep wool, cashmere, agora rabbit, etc). A few easy steps allow to avoid such unwanted materials:

- Wear gloves
- Wear long-sleeves
- Do not wear woolen, and other animal-fibers blends clothes while handling samples (angora, mohair, silk, fur, cashmere, etc...)
- Keep hair tied back or covered

Storing samples

Proteomics for textiles requires destructive sampling. As techniques develop, the sample size necessary becomes smaller and smaller. A few milligrams are required for species identification using peptide mass fingerprinting. Other proteomics analysis methods might require more, depending on the state of the sample. Textiles fragments recovered from restoration work or damaged areas can be used as long as they have not been in contact with other fabrics or other sources of contamination. Cleaning steps can be taken for very soiled and dusty samples.

Before sampling a textile, an evaluation of the threads in different areas should be undertaken to determine the best sampling strategy. If possible, multiple samples should be taken, especially if threads appear different. Undyed samples are better to avoid chemical complications and damage caused by the dyes. Indigo dye, for example, is an insoluble molecular contaminant inside the fiber, even if not actually cross-linked, making the fibers and proteins harder to extract from indigo-dyed threads [11]. PMF analysis has shown successful results from threads in contact with metals [60] but not from fabrics that have evidence of being burnt or exposed to high temperature (unpublished data).

Samples can be taken as threads (a few millimeters to 0.5 cm) cut with a scissor or as a piece of the fabric, in which case size will vary depending on whether the fabric is silk, wool or leather. Keep in mind that fibers might be very brittle when handling with forceps, and might become loose. Proper storage and shipping methods are:

- Whole threads, fabric pieces with good structural integrity: store in plastic tubes, eppendorfs or glass vials with wide opening, so that the sample can be taken out with forceps.
- Ancient samples tend to be brittle and fragile. If the sample is at risk of disintegrating, and fibers are becoming loose, place the sample on non-acidic paper, fold the paper and place it in a tube. Loose fibers would stick to the tube if not on paper and be difficult to reach. "Glassine" or "weighing papers" used for measuring weights provide a smooth support paper.

- If fibers are placed directly in the tube, weight the tube before and after placing the sample to get the exact weight of the sample.
- Avoid plastic bags, unless samples are placed in folded paper and not at risk of getting loose.

Acknowledgements

The author thanks the Smithsonian Museum Conservation Institute and in particular textile conservator Mary Ballard for advice, discussions and reviewing of the manuscript, and Drs. Paula DePriest and Robert Koestler for actively supporting proteomics research at MCI. Drs. Jeff Plowman, Santanu Deb-Choudhury, Stefan Clerens, Jolon Dyer and the team at AgResearch, Christchurch, NZ, as well as Prof. Matthew Collins at the University of York, UK are also warmly thanked for supporting and contributing to a large part of the mentioned research.

ORCID

Caroline Solazzo
https://orcid.org/0000-0001-5092-0807

References

1 Giuffrida, M. G.; Mazzoli, R.; Pessione, E., 'Back to the past: deciphering cultural heritage secrets by protein identification', *Applied Microbiology and Biotechnology* **102** (2018) 5445-5455, https://doi.org/10.1007/s00253-018-8963-z.

2 Vinciguerra, R.; De Chiaro, A.; Pucci, P.; Marino, G.; Birolo, L., 'Proteomic strategies for cultural heritage: From bones to paintings', *Microchemical Journal* 126 (2016) 341-348, https://doi.org/10.1016/j.microc.2015.12.024.

3 Hendy, J.; Welker, F.; Demarchi, B.; Speller, C.; Warinner, C.; Collins, M. J., 'A guide to ancient protein studies', *Nature Ecology & Evolution* **2** (2018) 791-799, https://doi.org/10.1038/s41559-018-0510-x.

4 Collins, M.; Buckley, M.; Thomas-Oates, J.; Wilson, J.; Doorn, N. Van, 'ZooMS: the collagen barcode and fingerprints', *Spectroscopy Europe* **22** (2010) 11-13.

5 Hollemeyer, K.; Altmeyer, W.; Heinzle, E.; Pitra, C., 'Matrix-assisted laser desorption/ionization time-of-flight mass spectrometry combined with multidimensional scaling, binary hierarchical cluster tree and selected diagnostic masses improves species identification of Neolithic keratin sequences from furs of the Tyrolean Iceman Oetzi', *Rapid Communications in Mass Spectrometry* **26** (2012) 1735-1745, https://doi.org/10.1002/rcm.6277.

6 Solazzo, C.; Heald, S.; Ballard, M. W.; Ashford, D. A.; DePriest, P. T.; Koestler, R. J.; Collins, M. J., 'Proteomics and Coast Salish blankets: a tale of shaggy dogs?', *Antiquity* **85** (2011) 1418-1432, https://doi.org/10.1017/S0003598X00062141.

7 Solazzo, C., 'Report on the proteomic analysis of hairs from the basketry container, the braided band and the pelt from the Whitehorse Hill cist' in *Preserved in the Peat: An Extraordinary Bronze Age Burial on Whitehose Hill, Dartmoor, and Its Wider Context*, ed. A. M. Jones, Oxbow Books, Oxford (2016) 274-286.

8 Popowich, A. K.; Cleland, T. P.; Solazzo, C., 'Characterization of membrane metal threads by proteomics and analysis of a 14th c. thread from an Italian textile', *Journal of Cultural Heritage* **33** (2018) 10-17, https://doi.org/10.1016/j.culher.2018.03.007.

9 Brandt, L. Ø.; Schmidt, A. L.; Mannering, U.; Sarret, M.; Kelstrup, C. D.; Olsen, J. V.; Cappellini, E., 'Species identification of archaeological skin objects from Danish bogs: comparison between mass spectrometry-based peptide sequencing and microscopy-based methods', *PLoS ONE* **9**(9) (2014) e106875, https://doi.org/10.1371/journal.pone.0106875.

10 Kirby, D. P.; Buckley, M.; Promise, E.; Trauger, S. A.; Holdcraft, T. R., 'Identification of collagen-based materials in cultural heritage', *Analyst* **138** (2013) 4849-4858, https://doi.org/10.1039/c3an00925d.

11 Solazzo, C.; Dyer, J. M.; Clerens, S.; Plowman, J. E.; Peacock, E. E.; Collins, M. J., 'Proteomic evaluation of the biodegradation of wool fabrics in experimental burials', *International Biodeterioration & Biodegradation* **80** (2013) 48-59, https://doi.org/10.1016/j.ibiod.2012.11.013.

12 Solazzo, C.; Dyer, J. M.; Deb-Choudhury, S.; Clerens, S.; Wyeth, P., 'Proteomic profiling of the photo-oxidation of silk fibroin: implications for historic tin-weighted silk', *Photochemistry and Photobiology* **88** (2012) 1217-1226, https://doi.org/10.1111/j.1751-1097.2012.01167.x.

13 Solazzo, C.; Wilson, J.; Dyer, J. M.; Clerens, S.; Plowman, J. E.; Holstein, I. von; Rogers, P. Walton; Peacock, E. E.; Collins, M., 'Modeling deamidation in sheep α-keratin peptides and application to archaeological wool textiles', *Analytical Chemistry* **86** (2014) 567-575, https://doi.org/10.1021/ac4026362.

14 Henzel, W. J.; Watanabe, C.; Stults, J. T., 'Protein identification: the origins of peptide mass fingerprinting', *Journal of the American Society for Mass Spectrometry* **14** (2003) 931-942, https://doi.org/10.1016/S1044-0305(03)00214-9.

15 Plowman, J. E., 'Proteomic database of wool components', *Journal of Chromatography B* **787** (2003) 63-76, https://doi.org/10.1016/S1570-0232(02)00211-8.

16 Solazzo, C., 'Follow-up on the characterization of peptidic markers in hair and fur for the identification of common North American species', *Rapid Communications in Mass Spectrometry* **31** (2017) 1375-1384, https://doi.org/10.1002/rcm.7923.

17 Solazzo, C.; Wadsley, M.; Dyer, J. M.; Clerens, S.; Collins, M. J.; Plowman, J., 'Characterisation of novel α-keratin peptide markers for species identification in keratinous tissues using mass spectrometry', *Rapid Communications in Mass Spectrometry* **27** (2013) 2685–2698, https://doi.org/10.1002/rcm.6730.

18 Florian, M.-L. E., *Protein Facts: Fibrous Proteins in Cultural and Natural History Artifacts*, Archetype Publications, London (2007).

19 Weisel, J. W.; Nagaswami, C.; Peterson, R. O., 'River otter hair structure facilitates interlocking to impede penetration of water and allow trapping of air', *Canadian Journal of Zoology* **83** (2005) 649-655, https://doi.org/10.1139/z05-047.

20 Corner, D., 'The Tyranny of fashion: the case of the felt-hatting trade in the late seventeenth and eighteenth centuries', *Textile History* **22** (1991) 153-178, https://doi.org/10.1179/004049691793712549.

21 Whiteley, K. J.; Kaplin, I. J., 'The comparative arrangement of microfibrils in ortho-, meso-, and paracortical cells of merino-wool fibres', *The Journal of The Textile Institute* **68** (1977) 384-386, https://doi.org/10.1080/00405007708631416.

22 Rogers, G. E., 'Electron microscopy of wool', *Journal of Ultrastructure Research* **2** (1959) 309-330, https://doi.org/10.1016/S0022-5320(59)80004-6.

23 Deb-Choudhury, S.; Plowman, J. E.; Rao, K.; Lee, E.; Koten, C. van; Clerens, S.; Dyer, J. M.; Harland, D. P., 'Mapping the accessibility of the disulfide crosslink network in the wool fiber cortex', *Proteins: Structure, Function, and Bioinformatics* **83** (2015) 224-234, https://doi.org/10.1002/prot.24727.

24 Plowman, J. E., 'Proteomics in wool and fibre research', in *Proteomics in Domestic Animals: from Farm to Systems Biology*, ed. A. M. de Almeida, D. Eckersall & I. Miller, Springer International Publishing, Cham (2018) 281-296, https://doi.org/10.1007/978-3-319-69682-9_14.

25 Thomas, A.; Harland, D. P.; Clerens, S.; Deb-Choudhury, S.; Vernon, J. A.; Krsinic, G. L.; Walls, R. J.; Cornellison, C. D.; Plowman, J. E.; Dyer, J. M., 'Interspecies comparison of morphology, ultrastructure, and proteome of mammalian keratin fibers of similar diameter', *Journal of Agricultural and Food Chemistry* **60** (2012) 2434-2446, https://doi.org/10.1021/jf204811v.

26 Grömer, K.; Russ-Popa, G.; Saliari, K., 'Products of animal skin from Antiquity to the Medieval period', *Annalen des Naturhistorischen Museums in Wien, Serie A* **119** (2017) 69-93.

27 Zhang, P.; Aso, Y.; Yamamoto, K.; Banno, Y.; Wang, Y.; Tsuchida, K.; Kawaguchi, Y.; Fujii, H., 'Proteome analysis of silk gland proteins from the silkworm, Bombyx mori', *Proteomics* **6** (2006) 2586-2599, https://doi.org/10.1002/pmic.200500348.

28 Jin, H.-J.; Kaplan, D. L., 'Mechanism of silk processing in insects and spiders', *Nature* **424** (2003) 1057-1061, https://doi.org/10.1038/nature01809.

29 Marsh, R. E.; Corey, R. B.; Pauling, L., 'An investigation of the structure of silk fibroin', *Biochimica et Biophysica Acta* **16** (1955) 1-34, https://doi.org/10.1016/0006-3002(55)90178-5.

30 Mita, K.; Kasahara, M.; Sasaki, S.; Nagayasu, Y.; Yamada, T.; Kanamori, H.; Namiki, N.; Kitagawa, M.; Yamashita, H.; Yasukochi, Y.; Kadono-Okuda, K.; Yamamoto, K.; Ajimura, M.; Ravikumar, G.; Shimomura, M.; Nagamura, Y.; Shin-i, T.; Abe, H.; Shimada, T.; Morishita, S.; Sasaki, T., 'The genome sequence of silkworm, Bombyx mori', *DNA Research* **11** (2004) 27-35, https://doi.org/10.1093/dnares/11.1.27.

31 Xia, Q.; Zhou, Z.; Lu, C.; Cheng, D.; Dai, F.; Li, B.; Zhao, P.; Zha, X.; Cheng, T.; Chai, C.; Pan, G.; Xu, J.; Liu, C.; Lin, Y.; Qian, J.; Hou, Y.; Wu, Z.; Li, G.; Pan, M.; Li, C.; Shen, Y.; Lan, X.; Yuan, L.; Li, T.; Xu, H.; Yang, G.; Wan, Y.; Zhu, Y.; Yu, M.; Shen, W.; Wu, D.; Xiang, Z.; Yu, J.; Wang, J.; Li, R.; Shi, J.; Li, H.; Li, G.; Su, J.; Wang, X.; Li, G.; Zhang, Z.; Wu, Q.; Li, J.; Zhang, Q.; Wei, N.; Xu, J.; Sun, H.; Dong, L.; Liu, D.; Zhao, S.; Zhao, X.; Meng, Q.; Lan, F.; Huang, X.; Li, Y.; Fang, L.; Li, C.; Li, D.; Sun, Y.; Zhang, Z.; Yang, Z.; Huang, Y.; Xi, Y.; Qi, Q.; He, D.; Huang, H.; Zhang, X.; Wang, Z.; Li, W.; Cao, Y.; Yu, Y.; Yu, H.; Li, J.; Ye, J.; Chen, H.; Zhou, Y.; Liu, B.; Wang, J.; Ye, J.; Ji, H.; Li, S.; Ni, P.; Zhang, J.; Zhang, Y.; Zheng, H.; Mao, B.; Wang, W.; Ye, C.; Li, S.; Wang, J.; Wong, G. K.-S.; Yang, H., 'A draft sequence for the genome of the domesticated silkworm (Bombyx mori)', *Science* **306** (2004) 1937-1940, https://doi.org/10.1126/science.1102210.

32 Zhou, C.-Z.; Confalonieri, F.; Medina, N.; Zivanovic, Y.; Esnault, C.; Yang, T.; Jacquet, M.; Janin, J.; Duguet, M.; Perasso, R.; Li, Z.-G., 'Fine organization of Bombyx mori fibroin heavy chain gene', *Nucleic Acids Research* **28** (2000) 2413-2419, https://doi.org/10.1093/nar/28.12.2413.

33 Ha, S.-W.; Gracz, H. S.; Tonelli, A. E.; Hudson, S. M., 'Structural study of irregular amino acid sequences in the heavy chain of Bombyx mori silk fibroin', *Biomacromolecules* **6** (2005) 2563-2569, https://doi.org/10.1021/bm050294m.

34 Yamaguchi, K.; Kikuchi, Y.; Takagi, T.; Kikuchi, A.; Oyama, F.; Shimura, K.; Mizuno, S., 'Primary structure of the silk fibroin light chain determined by cDNA sequencing and peptide analysis', *Journal of Molecular Biology* **210** (1989) 127-139, https://doi.org/10.1016/0022-2836(89)90295-7.

35 S. Inoue, K. Tanaka, F. Arisaka, S. Kimura, K. Ohtomo, S. Mizuno, 'Silk fibroin of Bombyx mori is secreted, assembling a high molecular mass elementary unit consisting of H-chain, L-chain, and P25, with a 6:6:1 molar ratio', *Journal of Biological Chemistry* **275** (2000) 40517-40528, https://doi.org/10.1074/jbc.M006897200.

36 Zhang, P.; Yamamoto, K.; Aso, Y.; Banno, Y.; Sakano, D.; Wang, Y.; Fujii, H., 'Proteomic studies of isoforms of the P25 component of Bombyx mori fibroin', *Bioscience, Biotechnology, and Biochemistry* **69** (2005) 2086-2093, https://doi.org/10.1271/bbb.69.2086.

37 Solazzo, C.; Fitzhugh, W.; Kaplan, S.; Potter, C.; Dyer, J. M., 'Molecular markers in keratins from mysticeti whales for species identification of baleen in museum and archaeological collections', *PLoS ONE* **12**(8) e0183053, https://doi.org/10.1371/journal.pone.0183053.

38 Brooks, M. M., '"Astonish the world with. . . your new fiber mixture": Producing, promoting, and forgetting man-made protein fibers', in *The Age of Plastic: Ingenuity and Responsibility*, ed. O. Madden, A. E. Charola, K. C. Cobb, P. T. DePriest & R. J. Koestler (Eds.), Smithsonian Institution Scholarly Press, Washington (2017) 35-50.

39 Enegren, H. L.; Meo, F. (ed.), *Treasures from the Sea. Sea Silk and Shellfish Purple Dye in Antiquity*, Oxbow Books, Oxford (2017).

40 Diana, A.; Reguzzoni, M.; Congiu, T.; Rescigno, A.; Sollai, F.; Raspanti, M., 'The byssus threads of Pinna nobilis: A histochemical and ultrastructural study', *European Journal of Histochemistry* **61**(4) (2017) 2779, https://doi.org/10.4081/ejh.2017.2779.

41 Deb-Choudhury, S.; Plowman, J. E.; Harland, D. P., 'Chapter Eleven - Isolation and Analysis of Keratins and Keratin-Associated Proteins from Hair and Wool', in *Methods in Enzymology*, ed. M. B. Omary & R. K. H. Liem, Academic Press, (2016) 279-301, https://doi.org/https://doi.org/10.1016/bs.mie.2015.07.018.

42 Fiddyment, S.; Holsinger, B.; Ruzzier, C.; Devine, A.; Binois, A.; Albarella, U.; Fischer, R.; Nichols, E.; Curtis, A.; Cheese, E.; Teasdale, M. D.; Checkley-Scott, C.; Milner, S. J.; Rudy, K. M.; Johnson, E. J.; Vnouček, J.; Garrison, M.; McGrory, S.; Bradley, D. G.; Collins, M. J., 'Animal origin of 13th-century uterine vellum revealed using noninvasive peptide fingerprinting', *Proceedings of the National Academy of Sciences* **112**(49) (2015) 15066-15071, https://doi.org/10.1073/pnas.1512264112.

43 Feist, P.; Hummon, A., 'Proteomic challenges: sample preparation techniques for microgram-quantity protein analysis from biological samples', *International Journal of Molecular Sciences* **16**(2) (2015) 3537-3563, https://doi.org/10.3390/ijms16023537.

44 Roy, S.; Kumar, V., 'A practical approach on SDS PAGE for separation of protein', *International Journal of Science and Research* **3**(8) (2014) 955-960.

45 Cleland, T. P.; Schroeter, E. R., 'A comparison of common mass spectrometry approaches for paleoproteomics', *Journal of Proteome Research* **17**(3) (2018) 936-945, https://doi.org/10.1021/acs.jproteome.7b00703.

46 Appleyard, H. M., *Guide to the Identification of Animal Fibres*, British Textile Technology Group, Leeds (1978).

47 Brunner, H.; Coman, B. J., *The Identification of Mammalian Hair*, Inkata Press, Melbourne (1974).

48 Tridico, S. R.; Houck, M. M.; Kirkbride, K. P.; Smith, M. E.; Yates, B. C., 'Morphological identification of animal hairs: Myths and misconceptions, possibilities and pitfalls', *Forensic Science International* **238** (2014) 101-107, https://doi.org/10.1016/j.forsciint.2014.02.023.

49 Kerkhoff, K.; Cescutti, G.; Kruse, L.; Müssig, J., 'Development of a DNA-analytical method for the identification of animal hair fibers in textiles', *Textile Research Journal* **79**(1) (2009) 69-75, https://doi.org/10.1177/0040517508090488.

50 McGregor, B. A.; Liu, X.; Wang, X. G., 'Comparisons of the Fourier transform infrared spectra of cashmere, guard hair, wool and other animal fibres', *The Journal of The Textile Institute* **109**(6) (2018) 813-822, https://doi.org/10.1080/00405000.2017.1372057.

51 Li, S.; Zhang, Y.; Wang, J.; Yang, Y.; Miao, C.; Guo, Y.; Zhang, Z.; Cao, Q.; Shui, W., 'Combining untargeted and targeted proteomic strategies for discrimination and quantification of cashmere fibers', *PLoS ONE* **11**(1) (2016) e0147044, https://doi.org/10.1371/journal.pone.0147044.

52 Sara, P.; Mariangela, B.; Francesca, L.; Barbara, P.; Andrea, F.; Cinzia, T.; Claudia, V.; Stefano, S., 'Identification and quantification of different species in animal fibres by LC/ESI-MS analysis of keratin-derived proteolytic peptides', *Journal of Mass Spectrometry* **48**(8) (2013) 919-926, https://doi.org/10.1002/jms.3222.

53 Brandt, L.; Tranekjer, L.; Mannering, U.; Ringgaard, M.; Frei, K.; Willerslev, E.; Gleba, M.; Gilbert, M., 'Characterising the potential of sheep wool for ancient DNA analyses', *Archaeological and Anthropological Sciences* **3**(2) (2011) 209-221, https://doi.org/10.1007/s12520-011-0055-2.

54 Wang, B.; Gu, J.; You, Q.; Chen, B.; Zheng, H.; Zhou, Y.; Hu, Z., 'Preparation of artificial antibodies and development of an antibody-based indirect ELISA for the detection of ancient wool', *Analytical Methods* **10**(12) (2018) 1480-1487, https://doi.org/10.1039/c8ay00015h.

55 Wang, B.; Gu, J.; Chen, B.; Xu, C.; Zheng, H.; Peng, Z.; Zhou, Y.; Hu, Z., 'Development of an enzyme-linked immunosorbent assay and gold-labelled immunochromatographic strip assay for the detection of ancient wool', *Journal of Analytical Methods in Chemistry* **2018** (2018) 2641624, https://doi.org/10.1155/2018/2641624.

56 Liu, M.; Xie, J.; Zheng, H.; Zhou, Y.; Wang, B.; Hu, Z., 'Identification of ancient silk using an enzyme-linked immunosorbent assay and immuno-fluorescence microscopy', *Analytical Sciences* **31**(12) (2015) 1317-1323, https://doi.org/10.2116/analsci.31.1317.

57 Zheng, Q.; Wu, X.; Zheng, H.; Zhou, Y., 'Development of an enzyme-linked-immunosorbent-assay technique for accurate identification of poorly preserved silks unearthed in ancient tombs', *Analytical and Bioanalytical Chemistry* **407**(13) (2015) 3861-3867, https://doi.org/10.1007/s00216-015-8621-6.

58 Liu, M.; Li, Y.; Zheng, H.; Zhou, Y.; Wang, B.; Hu, Z., 'Development of a gold-based immunochromatographic strip assay for the detection of ancient silk', *Analytical Methods* **7**(18) (2015) 7824-7830, https://doi.org/10.1039/c5ay01591j.

59 Hollemeyer, K.; Altmeyer, W.; Heinzle, E.; Pitra, C., 'Species identification of Oetzi's clothing with matrix-assisted laser desorption/ionization time-of-flight mass spectrometry based on peptide pattern similarities of hair digests', *Rapid Communications in Mass Spectrometry* **22** (2008) 2751–2767, https://doi.org/10.1002/rcm.3679.

60 Solazzo, C.; Rogers, P. W.; Weber, L.; Beaubien, H. F.; Wilson, J.; Collins, M., 'Species identification by peptide mass fingerprinting (PMF) in fibre products preserved by association with copper-alloy artefacts', *Journal of Archaeological Science* **49** (2014) 524-535, https://doi.org/10.1016/j.jas.2014.06.009.

61 Ackacha, M. A.; Polec-Pawlak, K.; Jarosz, M., 'Identification of anthraquinone coloring matters in natural red dyestuffs by high performance liquid chromatography with ultraviolet and electrospray mass spectrometric detection', *Journal of Separation Science* **26**(11) (2003) 1028-1034, https://doi.org/10.1007/978-94-010-0193-9_15.

62 Karatzani, A., 'The evolution of a craft: The use of metal threads in the decoration of late and post Byzantine ecclesiastical textiles', thesis, University College London, London (2007).

63 Indictor, N.; Koestler, R. J.; Wypyski, M.; Wardwell, A. E., 'Metal threads made of proteinaceous substrates examined by scanning electron microscopy: energy dispersive X-ray spectrometry', *Studies in Conservation* **34** (1989) 171-182, https://doi.org/10.1179/sic.1989.34.4.171.

64 A. Cheung, 'Untold stories of traditional Chinese children's hats – blessing, crafmanship, conservation', communication, *IIC-Palace Museum 2017 Hong Kong Symposium*, International Institute of Conservation, Hong Kong (2017).

65 Járó, M.; Gondár, E., 'Mediaeval Membrane threads used for weaving and Embroidery', in *Archaeometrical Research in Hungary*, ed. M. Járó & L. Költõ, The National Centre of Museums, Budapest (1988) 255-266.

66 Deb Choudhury, S.; Allsop, T.; Passman, A.; Norris, G. E., 'Use of a proteomics approach to identify favourable conditions for production of good quality lambskin leather', *Analytical and Bioanalytical Chemistry* **384**(3) (2006) 723-735, https://doi.org/10.1007/s00216-005-0228-x.

67 Arunkumar, K. P.; Metta, M.; Nagaraju, J., 'Molecular phylogeny of silkmoths reveals the origin of domesticated silkmoth, Bombyx mori from Chinese Bombyx mandarina and paternal inheritance of Antheraea proylei mitochondrial DNA', *Molecular Phylogenetics and Evolution* **40**(2) (2006) 419-427, https://doi.org/10.1016/j.ympev.2006.02.023.

68 Li, L.; Gong, Y.; Yin, H.; Gong, D., 'Different types of peptide detected by mass spectrometry among fresh silk and archaeological silk remains for distinguishing modern contamination', *PLoS ONE* **10**(7) (2015) e0132827, https://doi.org/10.1371/journal.pone.0132827.

69 Yu, X.; Gong, Y.; Tan, P.; Shu, J.; Liu, F.; Yang, J.; Gong, D., 'Mass spectrometry analysis of textile used in decorating the coronet of Empress Xiao of the Sui Dynasty (581–618 A.D.)', *Journal of Cultural Heritage* **25** (2017) 185-188, https://doi.org/https://doi.org/10.1016/j.culher.2017.01.003.

70 Malay, A. D.; Sato, R.; Yazawa, K.; Watanabe, H.; Ifuku, N.; Masunaga, H.; Hikima, T.; Guan, J.; Mandal, B. B.; Damrongsakkul, S.; Numata, K., 'Relationships between physical properties and sequence in silkworm silks', *Scientific Reports* **6** (2016) 27573, https://doi.org/10.1038/srep27573.

71 Alberto, F. J.; Boyer, F.; Orozco-terWengel, P.; Streeter, I.; Servin, B.; de Villemereuil, P.; Benjelloun, B.; Librado, P.; Biscarini, F.; Colli, L.; Barbato, M.; Zamani, W.; Alberti, A.; Engelen, S.; Stella, A.; Joost, S.; Ajmone-Marsan, P.; Negrini, R.; Orlando, L.; Rezaei, H. R.; Naderi, S.; Clarke, L.; Flicek, P.; Wincker, P.; Coissac, E.; Kijas, J.; Tosser-Klopp, G.; Chikhi, A.; Bruford, M. W.; Taberlet, P.; Pompanon, F., 'Convergent genomic signatures of domestication in sheep and goats', *Nature Communications* **9**(1) (2018) 813, https://doi.org/10.1038/s41467-018-03206-y.

72 Allain, D.; Renieri, C., 'Genetics of fibre production and fleece characteristics in small ruminants, Angora rabbit and South American camelids', *Animal* **4**(9) (2010) 1472-1481, https://doi.org/10.1017/s1751731110000029.

73 Munro, J., 'Spanish merino wools and the nouvelles draperies: an industrial transformation in the Late Medieval Low Countries', *The Economic History Review* **58**(3) (2005) 431-484, https://doi.org/10.1111/j.1468-0289.2005.00310.x.

74 Ryder, M. L., 'The history of sheep breeds in Britain', *The Agricultural History Review* **12**(1) (1964) 1-12.

75 Gleba, M., 'From textiles to sheep: investigating wool fibre development in pre-Roman Italy using scanning electron microscopy (SEM)', *Journal of Archaeological Science* **39**(12) (2012) 3643-3661, https://doi.org/10.1016/j.jas.2012.06.021.

76 Rast-Eicher, A.; Bender Jørgensen, L., 'Sheep wool in Bronze Age and Iron Age Europe', *Journal of Archaeological Science* **40**(2) (2013) 1224-1241, https://doi.org/10.1016/j.jas.2012.09.030.

77 Ryder, M. L., 'Medieval sheep and wool types', *The Agricultural History Review* **32**(1) (1984) 14-28.

78 Flanagan, L. M.; Plowman, J. E.; Bryson, W. G., 'The high sulphur proteins of wool: Towards an understanding of sheep breed diversity', *Proteomics* **2**(9) (2002) 1240-1246, https://doi.org/10.1002/1615-9861(200209)2:9<1240::aid-prot1240>3.0.co;2-#.

79 E., P. J.; G., B. W.; William, J. T., 'Application of proteomics for determining protein markers for wool quality traits', *Electrophoresis* **21**(9) (2000) 1899-1906, https://doi.org/10.1002/(sici)1522-2683(20000501)21:9<1899::aid-elps1899>3.3.co;2-i.

80 Plowman, J. E.; Deb-Choudhury, S.; Bryson, W. G.; Clerens, S.; Dyer, J. M., 'Protein expression in orthocortical and paracortical cells of merino wool fibers', *Journal of Agricultural and Food Chemistry* **57**(6) (2009) 2174-2180, https://doi.org/10.1021/jf803290h.

81 Odlyha, M.; Wang, Q.; Foster, G. M.; de Groot, J.; Horton, M.; Bozec, L., 'Thermal analysis of model and historic tapestries', *Journal of Thermal Analysis and Calorimetry* **82**(3) (2005) 627-636, https://doi.org/10.1007/s10973-005-0943-8.

82 Odlyha, M.; Theodorakopoulos, C.; Campana, R., 'Studies on woollen threads from historical tapestries', *AUTEX Research Journal* **7**(1) (2007) 9-18.

83 Kissi, N.; Curran, K.; Vlachou-Mogire, C.; Fearn, T.; McCullough, L., 'Developing a non-invasive tool to assess the impact of oxidation on the structural integrity of historic wool in Tudor tapestries', *Heritage Science* **5**(1) (2017) 49, https://doi.org/10.1186/s40494-017-0162-1.

84 Garside, P.; Lahlil, S.; Wyeth, P., 'Characterization of historic silk by polarized attenuated total reflectance Fourier transform infrared spectroscopy for informed conservation', *Applied Spectroscopy* **59**(10) (2005) 1242-1247, https://doi.org/10.1366/000370205774430855.

85 Kim, J.; Wyeth, P., 'Towards a routine methodology for assessing the condition of historic silk', *e- Preservation Science* **6** (2009) 60-67.

86 Hallett, K.; Howell, D., 'Size exclusion chromatography of silk: inferring the tensile strength and assessing the condition of historic tapestries', in *ICOM Committee for Conservation 14th Triennial Meeting, The Hague*, ed. I. Verger, James & James - Earthscan, London (2005) 911-919.

87 Vanden Berghe, I., 'Towards an early warning system for oxidative degradation of protein fibres in historical tapestries by means of calibrated amino acid analysis', *Journal of Archaeological Science* **39** (2012) 1349-1359, https://doi.org/10.1016/j.jas.2011.12.033.

88 van Doorn, N. L.; Wilson, J.; Hollund, H.; Soressi, M.; Collins, M. J., 'Site-specific deamidation of glutamine: a new marker of bone collagen deterioration', *Rapid Communications in Mass Spectrometry* **26**(19) (2012) 2319-2327, https://doi.org/10.1002/rcm.6351.

89 Leo, G.; Bonaduce, I.; Andreotti, A.; Marino, G.; Pucci, P.; Colombini, M. P.; Birolo, L., 'Deamidation at asparagine and glutamine as a major modification upon deterioration/aging of proteinaceous binders in mural paintings', *Analytical Chemistry* **83**(6) (2011) 2056-2064, https://doi.org/10.1021/ac1027275.

90 Simpson, J. P.; Penkman, K. E. H.; Demarchi, B.; Koon, H.; Collins, M. J.; Thomas-Oates, J.; Shapiro, B.; Stark, M.; Wilson, J., 'The effects of demineralisation and sampling point variability on the measurement of glutamine deamidation in type I collagen extracted from bone', *Journal of Archaeological Science* **69** (2016) 29-38, https://doi.org/10.1016/j.jas.2016.02.002.

91 Schroeter, E. R.; Cleland, T. P., 'Glutamine deamidation: an indicator of antiquity, or preservational quality?', *Rapid Communications in Mass Spectrometry* **30**(2) (2016) 251-255, https://doi.org/doi:10.1002/rcm.7445.

92 Dyer, J. M.; Plowman, J. E.; Krsinic, G. L.; Deb-Choudhury, S.; Koehn, H.; Millington, K. R.; Clerens, S., 'Proteomic evaluation and location of UVB-induced photo-oxidation in wool', *Journal of Photochemistry and Photobiology B: Biology* **98**(2) (2010) 118-127, https://doi.org/10.1016/j.jphotobiol.2009.11.008.

93 Solazzo, C.; Clerens, S.; Plowman, J. E.; Wilson, J.; Peacock, E. E.; Dyer, J. M., 'Application of redox proteomics to the study of oxidative degradation products in archaeological wool', *Journal of Cultural Heritage* **16**(6) (2015) 896-903, https://doi.org/10.1016/j.culher.2015.02.006.

94 Dyer, J. M.; Bringans, S. D.; Bryson, W. G., 'Characterisation of photo-oxidation products within photoyellowed wool proteins: tryptophan and tyrosine derived chromophores', *Photochemical & Photobiological Sciences* **5**(7) (2006) 698-706, http://dx.doi.org/10.1039/B603030K.

Received: 2018-7-5
Revised: 2018-11-14
Accepted: 2018-12-11
Online: 2019-2-14

Estudos sobre têxteis históricos
Studies in historical textiles
A. Serrano, M. J. Ferreira, E. C. de Groot (ed.)

Article / Artigo

Material analysis versus historical dye recipes: ingredients found in black dyed wool from five Belgian archives (1650-1850)

Natalia Ortega Saez[1,*], Ina Vanden Berghe[2], Olivier Schalm[1], Bert De Munck[3], Joost Caen[1]

[1] *University of Antwerp, Faculty of Design Sciences, Heritage Department, Campus Mutsaard, Blindestraat 9, 2000 Antwerp, Belgium*
[2] *Royal Institute for Cultural Heritage (KIK/IRPA), Jubelpark 1, 1000 Brussel, Belgium*
[3] *University of Antwerp, Faculty of Arts, History Department, Grote Kauwenberg 18, 2000 Antwerp, Belgium*
** natalia.ortegasaez@uantwerpen.be*

Abstract
The relationship between bibliographic and archival research, on the one hand, and object-based study, on the other, forms a very important basis for research into historical production techniques. Several written sources provide insight into the recipes for dyeing black in the past. Yet, this does not guarantee that these written recipes are representative of an entire society or were used in the dyers practice. The way to assess how closely practical dyeing and written sources are aligned entail the chemical analysis of historical textiles. This article focuses on the identification of the ingredients used to dye wool black in the case of well-preserved and dated (1650-1850) historical textiles from five Belgian archives and some remaining historical artefacts. The results are compared with the technical knowledge of dyeing and the ingredients mentioned in written sources from the same period. The aim is to refine the knowledge of the different black dye ingredients used in practice in Northwest Europe during the period.

Keywords
Black dyeing
Wool
Belgian Archives
Logwood
Tannin
Indigo
Iron mordant

Análise material versus receitas históricas de tingimento: os ingredientes identificados em lã tingida de preto proveniente de cinco arquivos belgas (1650-1850)

Resumo
A relação entre a investigação bibliográfica e arquivística e a investigação baseada em objectos históricos constitui um ponto de partida fundamental para o estudo de antigas técnicas de produção. Várias fontes documentais dão uma imagem de como se tingia de preto no passado. Contudo, nada garante que estas receitas sejam representativas de uma sociedade no seu todo ou que fossem praticadas pelos próprios tintureiros. A análise química de têxteis históricos constitui um método eficaz para verificar a proximidade entre práticas de tingimento e fontes documentais. Este artigo foca-se na identificação dos ingredientes usados no tingimento de lã com cor preta num conjunto de têxteis históricos datados (1650-1850) e em excelente estado de conservação de cinco arquivos belgas e noutros objectos históricos. Os resultados são comparados com o saber tecnológico associado aos métodos de tingimento e aos ingredientes descritos segundo as fontes documentais da época. O objectivo é o de afinar o conhecimento sobre os ingredientes usados no tingimento de preto no noroeste da Europa durante o período em questão.

Palavras-chave
Tingimento de preto
Lã
Arquivos belgas
Pau-de-campeche
Taninos
Anil
Mordente de ferro

ISSN 2182-9942

Conservar Património **31** (2019) 115-132 | https://doi.org/10.14568/cp2018025
ARP - Associação Profissional de Conservadores-Restauradores de Portugal
http://revista.arp.org.pt

Introduction

Bibliographical sources of black dyeing

The historical recipe research on black dyed wool comprising the 1680-1850 period was based on the investigation of secondary literature in that period, during a PhD study [1]. The industrial period with the start of the use of synthetic dyes and chrome mordants is not part of this article, however.

The study focused mainly on literature recipes for black dyeing in Northern, Western and Southern Europe [2-15]. Many of these North-Western European recipes date back to Antiquity [16, p. 37; 17, p. 62]. The Low Countries, mainly the County of Flanders, the Duchy of Brabant and the County of Holland were the most prominent and most famous European regions for the production and finishing of woollen cloth from 1200 to 1700 [18, p. 122]. Therefore, the urban regulations and technological literature from towns such as Antwerp, Mechelen and Ghent, in present-day Belgium, Hondschoote, in present-day France (Département Nord, French Flanders), the Southern Netherlands, and Amsterdam, Leiden and Delft, in the Northern Netherlands, were important sources for this research. Information and ingredients were found in *books of secrets*, manuals for dyers, copies of manuscripts, encyclopaedias, and regulations. Most of these recipes contain sufficient information of chemistry, dyes and dyeing practice to be used for reconstructions.

Historical recipes and technology of black dyeing

Throughout the European countries, the same methods for black dyeing of wool were employed with minor variations by region [19, pp. 410-481; 20, pp. 328-329]. De Graaff distinguished two types of black dyeing processes:

> There are two ways of obtaining a black colour on textiles: (a) dyeing dark blue with woad or indigo and a second dyeing with madder on an alum mordant and (b) mordanting with an iron compound and dyeing with a tannin-containing plant material (gallnut, alder bark or sumac) [19, p. 315].

The use of various kinds of ingredients influenced the colour and the quality of the finished product. Dyeing with metal salts, tannin, woad and madder had already been practised since the Middle Ages. The respective guilds always tried to regulate the dyeing process while the dyers themselves were constantly looking for cheaper raw materials for economic reasons. The discovery of new, more competitive products and changing fashions, with a demand for even more varying shades of black, made it impossible to limit dyeing to the imposed and more expensive native raw materials. Both factors gradually brought about a fundamental change in the practice of black dyeing. During the eighteenth century, dyers were allowed to use a combination of a blue undertone dye and a treatment with metal salts. From the seventeenth century until the invention of synthetic dyes (1856), most black dyeing was done with tannins and iron compounds. In many cases, a blue undertone was required and applied with the blue dye logwood. Unfortunately, nowadays these popular black dyeing methods pose many conservation problems with respect to dye and fibre degradation [21].

Preservation of historical black woollen textiles

Most historical textiles from the sixteenth and seventeenth century did not survive the ravages of time and are otherwise often difficult to date, especially when dyed in a uniform colour without any figuration or pattern. This is since textiles were recycled and incorporated into costumes or furnishing fabrics over the centuries. Moreover, with tapestries as exception, no dates or signatures can be found on textiles. Well-documented black dyed woollen textiles from that period are extremely rare in present-day Belgium and the Netherlands. Only a few examples are known, such as two seventeenth century black woollen doublets from the Rijksmuseum in Amsterdam [20, pp. 313-323] and a few samples of black wool preserved in sixteenth and seventeenth century Flemish tapestries [22, pp. 22-38]. Usually (black) textiles are articles of use that were not created as objects of art. Textile findings obviously have an archaeological context but most often lack any clear frame of reference, origin, exact date of manufacture or information of the artisan or designer. Costumes and accessories can be stylistically placed in a certain period but, again, in most cases there is no signature or date. Given these factors, it is difficult to allocate representative samples to a certain period.

In the attempt to obtain historical woollen textiles from known timespan, the principal present-day Belgian archives and textile museums in the region of the city of Antwerp were consulted and samples were taken from archival documents with accompanying wool references, either well-dated or attributed to a certain period. Although it is not possible to determine exactly where the samples were woven and dyed, it may be assumed from the written sources that the production was situated in Western Europe, more specifically England or the Southern Netherlands. These textiles are still in good condition as they have been preserved from light degradation during their storage in the dark, well-conditioned archives. Due to the scarcity of the samples, it was not possible to consider the quality and type of fabric. High-quality fabrics were supposedly made of high-quality wool and dyed with high-quality ingredients and procedures. One can assume that the samples are high quality because they were found in trade letters and sample books, although this could only be assessed if dyeing recipes were included. On the other hand, it is generally known that English wool was frequently dyed in Antwerp by Antwerp dyers [23, p. 479].

In addition to the archival wool fabrics, four historical black artefacts were added to the study, found in the

Convent of the Women's Apostles in Antwerp, belonging to Agnes Baliques (last quarter of the seventeenth century).

Goal

This article will deal with the chemical material analysis of a collection of fifty-one historical black woollen textiles from the archives and artefacts from the 1650 to 1850 period with the aim to gain information about the applied organic and inorganic ingredients. The organic dyes were analysed with high-performance liquid chromatography with photodiode array detection. Chromatographic separation techniques are micro-destructive techniques which allow the identification of different organic dye and degradation molecules, based on the comparison of their characteristic eluting time and UV-VIS absorbance (and/or mass spectrum if such equipment is available) with those from known dye molecules. Although micro-destructive, these analytical techniques are to be preferred on historical samples as they are most efficient for detecting and identifying the individual components in dye mixtures, even in case of very similar molecules [24-31]. Solvents such as dimethyl formamide or dimethyl sulfoxide are preferred for the extraction of the marker molecules of indigoid dye sources, especially when molluscs are to be expected [32-35]. These solvents have the disadvantage that they are not able to extract mordant dyes. As multiple mordant dyes and tannins play a significant role in historical black dyeing recipes, acidic extraction was chosen for dye extraction in this study, hence allowing the detection of dyes from both chemical dye classes in the same extract [32].

The inorganic elements were investigated by means of element analysis with scanning electron microscopy with an energy dispersive X-ray detector, an established micro-invasive technique for element analysis of various artefacts. On historical textiles, it is used most often for the identification of the composition of metal threads or for the detection of elements that can be related to the practice of using metal mordants [21, 36].

The obtained organic and inorganic constituents from this study were compared with the ingredients mentioned in the historical recipes and prescribed in the regulations. The goal of this study is to improve and/or refine our knowledge of the variations in black dyeing methods that

Figure 1. Archive Melijn, Book T94/189, 1712-1714.

were applied in practice in Northwest Europe between 1650 and 1850.

Classification of historical recipes for dyeing black

A classification of the historical recipes for black dyeing was made from the bibliographic sources in the described geographical and historical context, by considering the presence or absence of certain ingredients. Detailed discussion of the ingredients found in the black dyeing recipes from historical sources is not part of this publication and was published elsewhere [1]. Three main groups of dyeing were distinguished, each with small variations in minor ingredients.

Type I dye recipes concern a two-stage dyeing procedure by which wool was dyed with a blue undertone by the use of the vat dyes from the indigo *(Indigofera tinctoria* L.*)* or woad *(Isatis tinctoria* L.*)* plants in different gradations. A minimum degree of intensity of the blue ground was a prerequisite for obtaining a solid dark blue undertone and was obtained by dipping the cloth several times into the dye vat. Hereafter, the wool was mordanted with alum and/or tartar and top-dyed with the red dyes from madder. Yellow mordant dyes such as weld (*Reseda luteola* L.) among others, were added to the dye bath to save on expensive material or to shade the black colour.

Recipes based on black dyeing with tannin form the basis of the Type II dye recipes. Tannins from various plants such as gallnuts, alder bark, sumac (*Rhus* species) or redoul (*Coriaria myrtifolia* L.) were combined with metal salts such as copperas. Copper red and copperas or green vitriol (*koperrood* in Dutch) were common ingredients for dyeing black, saddening or making a colour duller [20, p. 42]. Such dyeing could be done on a light blue undertone or on undyed wool. Green vitriol contains iron(II) sulphate, although partially also copper sulphate is present. Dyeing with tannin and green vitriol was already known since the Middle Ages in Europe to cause severe fibre damage and was therefore prohibited by regulations in all important wool cloth production centres [19, pp. 39-41]. Furthermore, also iron acetate was often used for black dyeing, as it was easy and cheap to produce. Iron swarf, rusty old nails, filings and dust from the grinding of edge tools in acetic acid form the basic materials to produce iron acetate.

The last main black dyeing group, Type III, comprises combinations of one or more blue dye source(s), either indigo, woad and/or logwood (*Haematoxylum campechianum* L.), together with tannins and metal salts. Apart from that, red dyes, such as madder (*Rubia tinctorum* L.) and redwood (*Caesalpinia* species), and yellow dyes, such as weld (*Reseda luteola* L.) or dyer's greenweed (*Genista tinctioria* L.), among others, were used to shade the black colour [1].

Figure 2. Samples from the craft of linen weavers GA 4202, 1757: *a)* W35a; *b)* W35.

Figure 3. Knijff family archives samples, c.1683, with three black samples (W92, W38 and 38a).

The three types of recipes are derived from historical sources. However, the majority of the written recipes describe Types II and III, while recipe Type I, considered as the most exclusive way to dye black, is only mentioned in very few recipes, probably because most written sources were not published for dyers but for household purposes and will therefore not reveal the professional details of two-stage dyeing of black [3, p. 190].

According to municipal regulations in the considered timespan, mainly of the city of Antwerp, Type I was the preferred way to dye black and was strictly regulated, while Type II was absolutely prohibited for wool dyeing and only allowed for application of silk. From the end of the 17th century onwards, Type III recipes were described for black dyeing of wool as well [1].

Chemical material analysis

Materials

Fifty-one historical wool samples with a deep brown and black colour were collected. Depending on the accuracy of dating information, they were attributed to the category of *well-dated* historical samples, historical textiles *attributed to a certain period* or to *historical artefacts*.

Well-dated historical textiles

The well-dated historical textiles were found in archives attached to a written document which was time stamped. It concerns commercial correspondence, inventories and family archives. To this group belong nineteen samples from the Melijn Archive (1681-1714), ten samples from the Antwerp City Archive (1675-1777) and five samples from the Belgian National Archive (1683-1696).

Melijn Archive, Fashion Museum Antwerp, 1681-1714

The Melijn Archive consists of a number of trade letters and is located partially in the Fashion Museum of Antwerp and in the Municipal Archives of Wijnegem [37]. Only letters with samples were consulted as well as journals and commercial correspondence (Figure 1). In this commercial correspondence, fabrics were described and orders were written down, giving an idea of the trading activities such as the different trade contacts, the weavers, the dyers, the

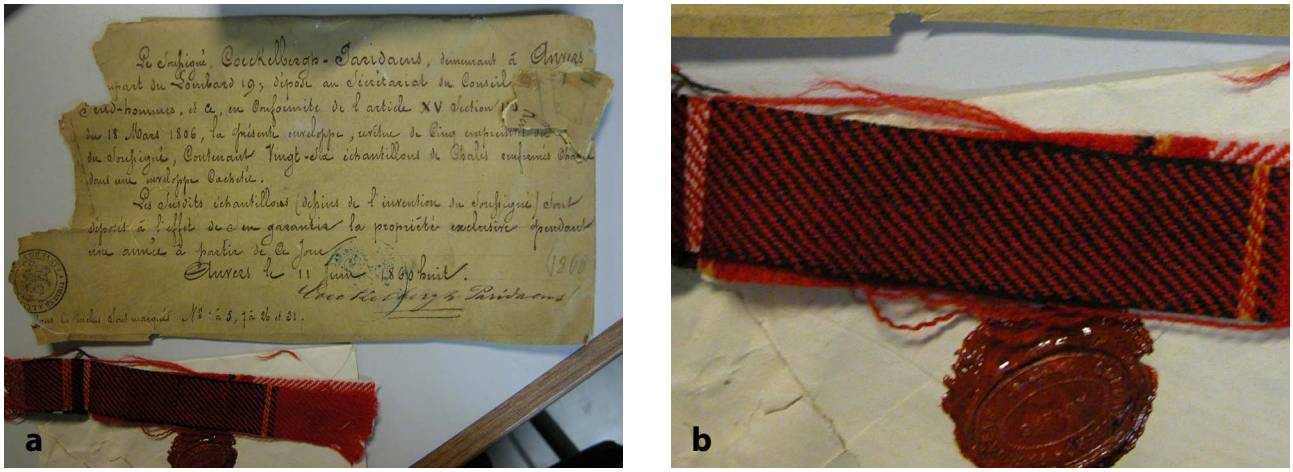


Figure 4. Industrial Tribunal: *a)* R540, no. 358/8/121; *b)* no. 1 (W37b).

Figure 5. Sample book, TB88/122, Fashion Museum Antwerp, c.1700-1750.

distributors and the customers. No information was present about the dyeing procedure. The archive mainly consists of correspondence between Jan Michiel Melijn and commercial agents in London. Black wool samples were taken from three books. This Archive was of particular importance for the study because it is well documented and the samples enclosed have a precise frame of reference.

Antwerp City Archive, 1675-1777

In the Antwerp City Archive, different trade archives and family archives were found. Black wool samples were collected from the Insolvent inventory of De Brier – Van den Berghe – De Lannoy, from the Insolvent inventory of De Bruyne, from the family archive of Jan Frans De Wolf and from the crafts of linen weavers, passementry and

ribbon trimmings. In case of wool and linen blends, only the black wool was taken for analysis. Figure 2 show some striped fabrics found in the craft of linen weavers.

National Archive Belgium, Antwerp section (1683-1696)

A total of five woollen samples were taken from the Belgian National Archive, Antwerp section, covering the period from 1683 until 1696. In Figure 3, thirteen woollen samples in assorted colours of the Knijff Family Archive are shown, attached to a document dated 3 September 1683. No information about dyes or fabric was found in the correspondence. Another two black samples dating from 1868 were found in the Industrial Tribunal (Sample R540, no. 358/8/121). These are woollen samples for shawls. Sample W37b is shown in Figure 4.

Historical samples attributed to a certain period

Fifteen samples attributed to a certain period were found in anonymous sample books. These samples have a broader dating as there is no correspondence attached to them. It concerns six samples found in two anonymous sample books from the Fashion Museum Antwerp (1700-1840) and nine samples from two anonymous sample books found in the Municipal Museum Lokeren (1870-1890).

Anonymous sample books, Fashion Museum Antwerp, 1700-1840

One of the sample books is a syllabus of a course concerning mainly jacquard weaving. Most of the samples are silk, although four woollen samples were found. Another sample book (Figure 5) was found with mainly woollen samples from which two black samples were taken.

Anonymous Archive Municipal Museum Lokeren, C. 1870-1890

These books are dated stylistically c. 1870-1890 (Figure 6). Most of the samples are tartan wool dyed in different colours, from which nine black samples were taken.

Historical artefacts

The historical artefacts were not attached to writings. Samples were dated stylistically in consultation with experts in this field [38]. Four historical artefacts were found in the Convent of the Women Apostles in Antwerp: two black widow's bonnets, two pieces of black cloth (once intended to be made into a bonnet), a coif and a shirt. The seventeenth-century black wool *Widow's Bonnet* was

Figure 6. Book II, 533, (W77), 1870-1890.

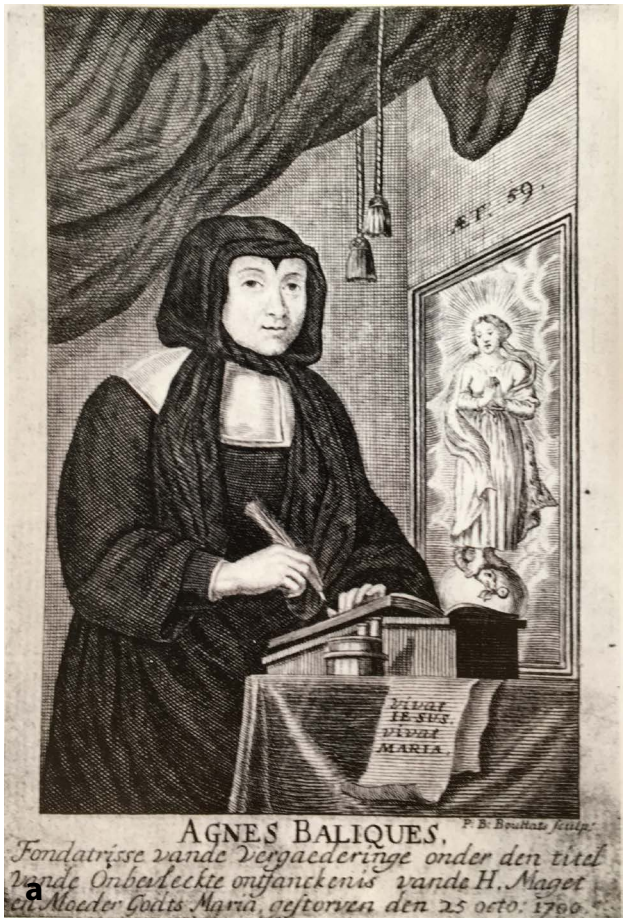


Figure 7. *a)* Engraving by P. B. Bouttats, Agnes Baliques, founder of the congregation of the Sisters Apostelinnen, Antwerp, first quarter eighteenth century. *b)* Black bonnet.

most likely originally owned by Agnes Baliques (1641-1700), born in Antwerp and founder of the Convent of the Women Apostles (*Klooster van de Apostelinnen* – now located on the *Diksmuidelaan* in Deurne). The surviving bonnet is a unique item and a precious historical example of a black dyed artefact from the Southern Netherlands. The bonnet is dated to the last quarter of the seventeenth century (Figure 7) and also stylistically matches to the seventeenth-century fashion [39, p. 66].

Methods

High performance liquid chromatography with photodiode array detection (HPLC-PDA)

Prior to chemical analysis, each yarn sample (sample size between 5 to 10 mm) was examined using an optical stereomicroscope under reflected illumination (Stemi stereomicroscope, Zeiss) for fibre characterisation and for elimination of possible contaminants. Dye extraction was executed after immersing the sample in 250 µl of a water / methanol / 37 % hydrochloric acid mixture in the volumetric ratio of 1:1:2 (v/v/v), which was heated for 10 minutes at 105 °C in open Pyrex tubes in a heating block. After cooling the acid preparation, any particular matter was removed by filtering through a porous polyethylene filter. The clear filtrate was dried in a vacuum rotator and the dried residue re-dissolved in 60 µl methanol/water 1:1 (v/v) mixture from which 20 µl was injected for analysis [28]. The equipment consisted of an Alliance HPLC system with auto sampler, a diode array detection system (PDA model 996) and data treatment software Empower 2, all from Waters. A RP-18 column was used (Lichrosorb (VWR), 125 mm × 4 mm diameter, 100 Å pore diameter and 5 µm particle size) at a fixed temperature of 25 °C. The mobile phase consists of A) pure methanol (grade: for HPLC > 99.8 %, from Acros Organics); B) methanol / water mixture 1:9 (v/v); and C) 5 % phosphoric acid (85 wt % pro analisi, Acros Organics). It was used according to the following gradient programme: 0-3 minutes: isocratic 23A/67B/10C; 3-29 minutes: linear gradient to 90A/0B/10C; 30-35 minutes: isocratic 23A/67B/10C. The water used was ultrapure deionised water (Milli-Q). The dye compounds were characterised by their elution time and their UV-visible absorbance spectra, which was compared against a non-commercial internal developed database of reference spectra.

Scanning electron microscope coupled to energy dispersive X-ray spectroscopy (SEM-EDX)

A scanning electron microscope with energy dispersive X-ray system was used to analyse the elements possibly referring to inorganic mordants. The instrument (Jeol 6300) was equipped with a thin-window Princeton Gamma Tech energy dispersive Si(Li) detector. A fibre of 1 mm was taken from each black woollen fabric. The fibres were coated with a thin layer of carbon applied by a SEM sputter coater (type SC7620 Mini Sputter Coater/ Glow Discharge System, Quorum Technologies). The carbon evaporates in a vacuum and provides the fibre with a thin layer of electrically conductive carbon. X-ray spectra were collected with a 2 nA electron beam at 20 keV. The spectra contain X-ray emission lines for elements down to carbon; detection limits of approximately 0.1 wt % for elements with an atomic number between 11 and 20

are obtained. The X-ray spectra were processed with the software package AXIL, with which the peak areas and the area of the Bremstrahlung background underneath the peaks could be calculated. With the areas obtained, it was possible to calculate the peak-to-background ratio for Fe and Cu. This approach is needed to suppress the impact of variable count rates that occurred from spectrum to spectrum. Three measurements were taken from each sample.

Results

Microscopic examination of the wool samples showed that the majority of the yarns were homogenously black dyed. Few yarn samples have a more heterogeneous composition with mostly black fibres spun together with a minor amount of red dyed fibres. This was the case for sample W26 from the Melijn Archive (book T94/189, folio 30 verso, 1712) and sample W29 (the same book on fol. 158 verso, 1714).

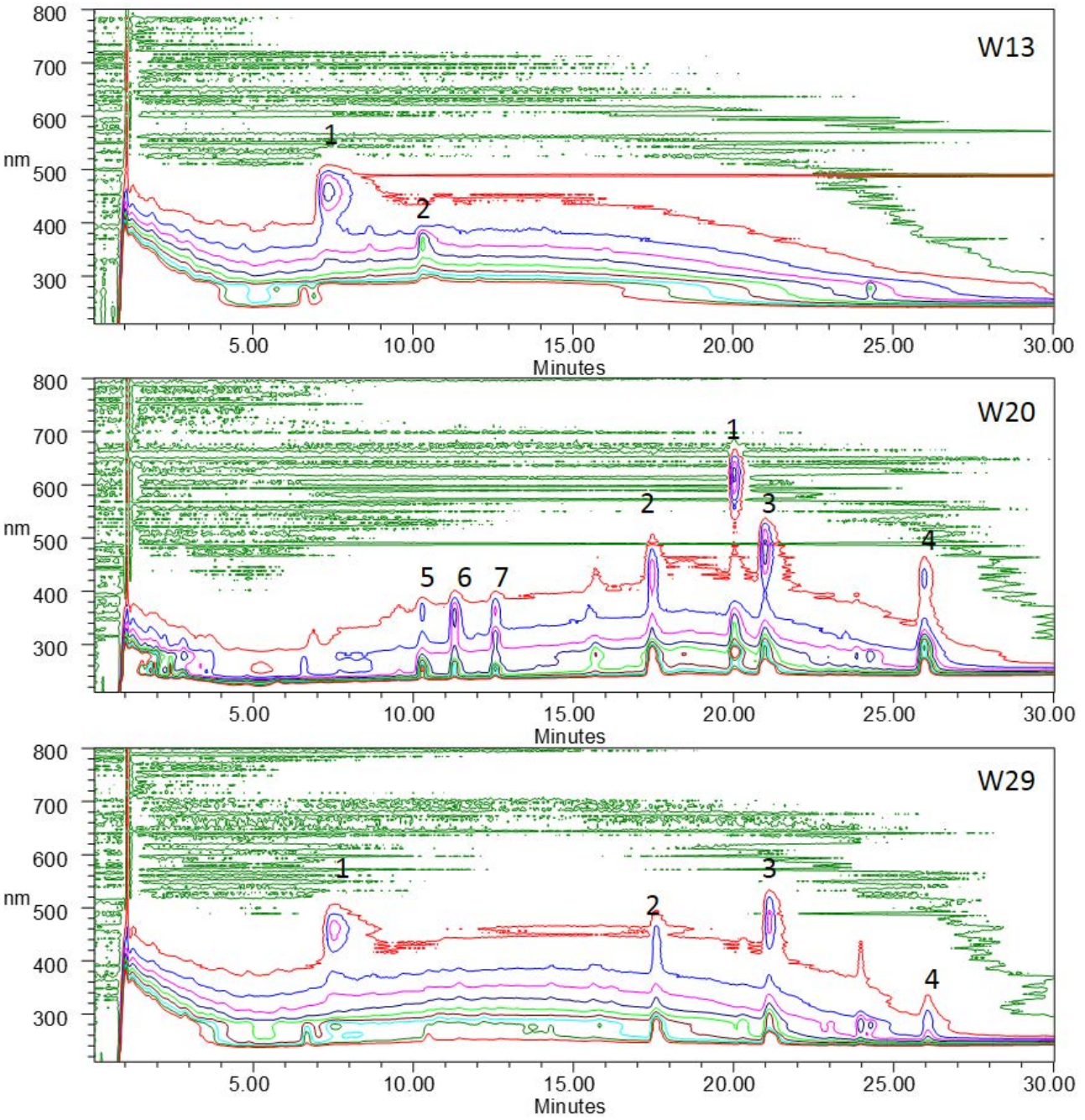


Figure 8. HPLC-DAD max-plots showing the absorbance intensities (coloured lines) of the most important molecules in function of the eluting time (x-axis) (in minutes) and absorbance spectra (y-axis) (between 240 nm and 800 nm) of samples W13, W20 and W29, Antwerp (Archive Melijn, 1681-1714). Absorbance peak maxima are present for hematoxylin derivative (1) and ellagic acid (2) in sample W13; of indigotin (1), alizarin (2), purpurin (3), nordamnacanthal (4), ellagic acid (5), morin (6) and maclurin (7) in sample W20 and of hematoxylin derivative (1), alizarin (2), purpurin (3) and nordamnacanthal (4) in sample W29.

Table 1
Results HPLC-PDA and SEM-EDX analyses

Archive	Book / Collection	Wool code, date	Wool colour	Main organic dye ingrediënts (HPLC-DAD)	Accompanying organic dye ingredients (HPLC-DAD)	Detected organic (dye) molecules (HPLC-DAD)	Inorganic elements (SEM-EDX)
Archive Melijn, Fashion Museum Antwerp, 1681-1714	Book T94/183, 1681-1682	W13, 1681	Black	Logwood and tannin	–	Hematoxylin, ellagic acid	Fe
		W14, 1681	Black	Logwood and tannin	Madder	Hematoxylin, ellagic acid, alizarin	Fe
		W15, 1681	Black	Logwood and tannin	Madder	Hematoxylin, ellagic acid, alizarin, purpurin	Fe
		W16, 1681	Dark brown	Logwood and tannin	Old fustic	Hematoxylin, ellagic acid, maclurin	Fe
		W17, 1681	Grey-Black	Logwood and tannin	Indigo/woad and madder	Hematoxylin, ellagic acid, alizarin, indigotin	Fe
		W18, 1682	Black	Logwood and tannin	–	Hematoxylin, ellagic acid	Fe
		W19a, 1682	Black	Logwood and tannin	Madder	Hematoxylin, ellagic acid, alizarin, purpurin, xanthopurpurin	Fe
		W19b, 1682	Black	Logwood and tannin	–	Hematoxylin, ellagic acid	Fe, Al
		W19c, 1682	Black	Logwood and tannin	–	Hematoxylin, ellagic acid	Fe
		W10, 1692	Dark brown	Tannin and madder	Old fustic and dyer's greenweed	Ellagic acid, genistein, luteolin, apigenin, alizarin, purpurin, nordamnacanthal, maclurin, morin, anthragallol, xanthopurpurin	Fe
	Book T94/187, 1695	W20, 1695	Rred-black & blue	Indigo/woad and madder	Tannin and old fustic	Indigotin, alizarin, purpurin, morin, maclurin, nordamnacanthal, ellagic acid, anthragallol, rubiadin, kampferol, munjistin	Fe
		W21, 1696	Red-black & blue	Indigo/woad and madder	Tannin and old fustic	Indigotin, alizarin, purpurin, morin, maclurin, nordamnacanthal, ellagic acid, anthragallol, rubiadin, munjistin	Fe
		W24, 1695	Brown-black	Indigo/woad and madder	Tannin, old fustic and dyer's greenweed	Indigotin, ellagic acid, morin, maclurin, genistein, luteolin, apigenin, alizarin, purpurin, nordamnacanthal, rubiadin	Fe
		W25, 1696	Brown-black	Indigo/woad and madder	Tannin and old fustic	Indigotin, alizarin, purpurin, morin, maclurin, nordamnacanthal, ellagic acid, anthragallol, rubiadin, munjistin	–
	Book T94/189, 1712-1714	W26, 1712	Red-brown	Logwood and madder	Tannin	Alizarin, purpurin, nordamnacanthal, ellagic acid, hematoxylin, rubiadin, xanthopurpurin	Fe
		W27, 1713	Black	Logwood and tannin	Old fustic and weld	Ellagic acid, hematoxylin, quercetin, luteolin, kampferol, apigenin	Fe
		W28a,1713	Black	Logwood and madder	Tannin, old fustic and weld	Alizarin, purpurin, hematoxylin, ellagic acid, maclurin, kampferol, luteolin, rubiadin, xanthopurpurin	Fe
		W28b, 1713	Black	Logwood and madder	Tannin and old fustic	Alizarin, purpurin, hematoxylin, ellagic acid, morin, maclurin, kampferol, rubiadin, xanthopurpurin	Fe
		W29, 1714	Red-black	Logwood and madder	Tannin, old fustic and weld	Alizarin, purpurin, nordamnacanthal, hematoxylin, ellagic acid, rubiadin, xanthopurpurin, maclurin, luteolin, kampferol, apigenin, anthragallol	Fe

Table 1 ***(continued)***

Archive	Book / Collection	Wool code, date	Wool colour	Main organic dye ingrediënts (HPLC-DAD)	Accompanying organic dye ingredients (HPLC-DAD)	Detected organic (dye) molecules (HPLC-DAD)	Inorganic elements (SEM-EDX)
City Archive Antwerp, 1675-1777	Insolvent inventory of De Brier-Van den Berghe – De Lannoy and of De Bruyne and family archive of Jan Frans De Wolf	W32, 1675-1725	Black	Tannin	Young fustic	Ellagic acid, sulfuretin	Fe, Al
		W34, 1675-1725	Black	Tannin	Old fustic and weld	Ellagic acid, quercetin, luteolin, kampferol	Fe, Cu, Al
		W68, 1771	Black	Tannin and madder	Brazilwood and weld	Alizarin, purpurin, ellagic acid, urolithine C, luteolin, kampferol, apigenin, xanthopurpurin, munjistin	Fe
		W68a, 1771	Black	Logwood and madder	Indigo/woad	Alizarin, purpurin, hematoxylin, indigotin	Fe
		W69, 1777	Brown-Black	Tannin and sandalwood	–	Ellagic acid, santalin	Fe, Al
	Crafts of linen weavers, passementary and ribbon trimmings, 1700-1757	W35, 1757	Black	Logwood	–	Hematoxylin	Fe, Cu
		W35a, 1757	Black	Tannin, madder and logwood	Weld	Ellagic acid, hematoxylin, alizarin, purpurin, luteolin, apigenin, nordamnacanthal, xanthopurpurin, rubiadin	Fe, Cu
		W35b, 1757	Black	Logwood	–	Hematoxylin	Fe, Cu
		W36, 1700-1775	Black	Tannin	Old fustic	Ellagic acid, kampferol	Fe
		W60, 1757	Black	Logwood, tannin and weld	–	Ellagic acid, hematoxylin, luteolin, apigenin	Fe
Belgium National Archive, 1683-1696	Industrial Tribunal, 1868	W37b, 1868	Black	Logwood	–	Hematoxylin	Fe
		W37, 1868	Black	Logwood	–	Hematoxylin	Fe
	Family Archives Knijff 1683-1696	W92, 1683	Brownish Black	Tannin	Dyer's greenweed	Ellagic acid	Fe
		W38, 1696	Black	Logwood, tannin and madder	–	Hematoxylin, ellagic acid, alizarin, purpurin, antragallol, xanthopurpurin, rubiadin	Fe
		W38a, 1696	Brownish Black	Tannin and brazilwood	Old fustic	Ellagic acid, urolithine C, sulfuretin	Fe
Anonymous sample books Fashion Museum Antwerp	Book TB88 / 122, 1700-1750	W30	Black	Logwood, tannin, indigo/ woad and brazilwood	Madder and weld	Hematoxylin, ellagic acid, indigotin, luteolin, urolithine C, apigenin, alizarin	–
		W31	Black	Logwood and indigo/woad	Old fustic and weld	Hematoxylin, indigotin, maclurin, quercetin, luteolin, kampferol, apigenin	Fe
	Book T99/103, 1820-1840	W59, 1822	Black	Logwood and dyer's greenweed	Tannin	Hematoxylin, ellagic acid, genistein, luteolin, apigenin	–
		WT99 / 103A,B, 1820-1840	Red-black	Logwood and tannin	Cochineal, brazilwood and old fustic, indigo/woad	Hematoxylin, ellagic acid, urolithine C, maclurin, carminic acid, indigotin	Fe, Cu, Al

Table 1 ***(continued)***

Archive	Book / Collection	Wool code, date	Wool colour	Main organic dye ingrediënts (HPLC-DAD)	Accompanying organic dye ingredients (HPLC-DAD)	Detected organic (dye) molecules (HPLC-DAD)	Inorganic elements (SEM-EDX)
Anonymous Archive, Municipal Museum, Lokeren, 1870-1890	Book I, 1870-1890	W70	Black	Logwood	–	Hematoxylin	Fe, Cu
		W71	Black	Logwood	Brazilwood	Hematoxylin, urolithine C	Fe, Cu
		W72	Black	Logwood and tannin	–	Hematoxylin, ellagic acid	Fe, Cu
		W73	Black	Logwood	–	Hematoxylin	Fe, Cu, Al
	Book II, 1870-1890	W74	brown-Black	Logwood	Indigo/woad and madder	Hematoxylin, alizarin, indigotin	Fe, Cu
		W75	Black	Logwood and indigo/woad	Old fustic	Hematoxylin, maclurin, indigotin, indirubin	Fe, Cu
		W76	brown-Black	Logwood	–	Hematoxylin	–
		W77	Black	Indigo/woad and tannin	–	Ellagic acid, indigotin, indirubin	Fe, Cu
		W78	Black	Logwood and indigo/woad	–	Hematoxylin, indigotin	–
Historical Artefacts: textiles attributed to Agnes Baliques, 1675-1700		W79	Black	Tannin and indigo/woad	–	Ellagic acid, indigotin	Fe
		W80	Black	Tannin and logwood	–	Hematoxylin, ellagic acid	Fe
		W81	Black	Logwood	–	Hematoxylin	Fe
		W82	Black	Logwood	–	Hematoxylin	Fe, Cu

The results of the chromatographic and elemental analysis of the historical wool samples are summarized for each archive and for the historical artefacts in Table 1. The code and currently observed colour of the samples are mentioned in the first two columns, while column 5 describes the organic dye and dye marker molecules detected after HPLC-DAD analysis of the dye extracts. The corresponding biological dye sources (plant or animal) are given in columns 3 and 4. In an attempt to link the identified organic dye ingredients to the likely dyeing processes used, a distinction was made between the most important and the less important, or accompanying dye ingredients for each black dyeing, based on the relative intensities of the peak areas of the different molecules. The main dye ingredient(s) for each black dyeing is listed in column 3, the less prominent dye source(s) in column 4. When multiple dye molecules were prominently present, they were all considered as main ingredients.

Three examples are given in Figure 8 to show how the attribution between main and accompanying dye sources was made with the help of the HPLC max-plots, which give the absorbance intensity of each chemical compound (coloured lines) as function of the eluting time (x-axis) and absorbance spectra (y-axis) of samples W13, W20 and W29. A systematic description of all detected dye compounds and related dye sources is given bellow. Logwood and tannin were defined as main ingredients of sample W13 based on the detection of a derivative of hematoxylin and ellagic acid. No accompanying ingredients were used. The main ingredients found in sample W20 are indigo/woad and madder, based on the detection of prominent peaks of indigotin and alizarin, purpurin and nordamnacanthal. Tannin and old fustic are considered as accompanying ingredients due to the less prominent intensity of the compounds ellagic acid, morin and maclurin. It must be noted that not all the detected components can be seen on the max-plot. Logwood and madder are the main ingredients of W29, based on the major peaks of alizarin, purpurin and the derivative of hematoxylin, while tannin, old fustic and weld are considered as minor ingredients, due to the low intensity of the compounds ellagic acid, maclurin, kampferol, luteolin, apigenin (hardly detectable on the max-plot).

Elements detected with SEM-EDX are presented in the last column of Table 1. Iron, copper and aluminium are three elements frequently detected although with a low signal. As these elements are common contaminants present in water, dust and dirt, their presence does not imply the use of metal mordants and, for this reason, cannot be interpreted as a possible reference to mordants. Only detection of elements with a mean normalised K-alpha peak of, at least, 0.05 are listed in Table 1.

For all samples where iron and copper were measured, the ratio between the detected iron (normalised Fe K-alpha peak) and copper (normalised Cu K-alpha peak) is presented in Figure 9. Four groups are distinguished according to the date of the samples. Iron is detected in various amounts in all samples throughout the whole period of 1650-1890. However, the use of an iron based mordant with a higher content of copper seems not to occur before 1720, while becoming more popular in the eighteenth and nineteenth century (in the 1720-1820 and 1850-1890). A linear relationship between the copper and iron peak signals was observed for a few samples from the 1720-1820 period (blue dots), which might be an indication of the use of a similar mordant with higher copper content in these samples. This linear relation does not apply, however, for the samples dated from the later period of 1850-1890 (yellow dots). More analyses of historical samples are required to confirm these observations.

Discussion on the ingredients and techniques

Organic dye ingredients

Tannin

Ellagic acid is a marker compound which refers to the presence of ellagi- or gallotannins, polyphenolic secondary metabolites of higher plants [19, pp. 691-694], also known as hydrolysable tannins. This organic molecule was identified in thirty-nine samples, few times in combination with gallic acid. Tannins are present in various parts of the structure of numerous plant species geographically distributed all over the world. Since prehistoric times, they were used as mordant and/or dyeing ingredient for textiles. The fact that often only ellagic acid is detected in the extracts of historical textiles after acidic hydrolysis makes it impossible so far to identify the exact plant species [19, pp. 409-484]. Therefore, this ingredient is mentioned in the result table as *tannin*. From the historical recipe sources, on the other hand, it is clear that gallnuts from the gall oak (*Quercus infectoria* L.) or sumac *(Rhus species.)* are among the most probable sources [1, p. 287; 19, pp. 414-415].

Indigo and/or woad (vat dyes)

Fourteen samples were found containing indigotin, the major dye molecule referring to a vat dyeing with indigo (*Indigofera* or *Polygonum* species) or with woad (*Isatis tinctoria* L.). In a few samples, the minor compound indirubin was also detected. As both indigotin and indirubin are the marker compound found in the extracts of fibres dyed with indigo species or woad, no distinction can be made between the two. Therefore, they are always mentioned together. In seventeenth-century Europe however, indigo was used more frequently than woad [19, p. 214].

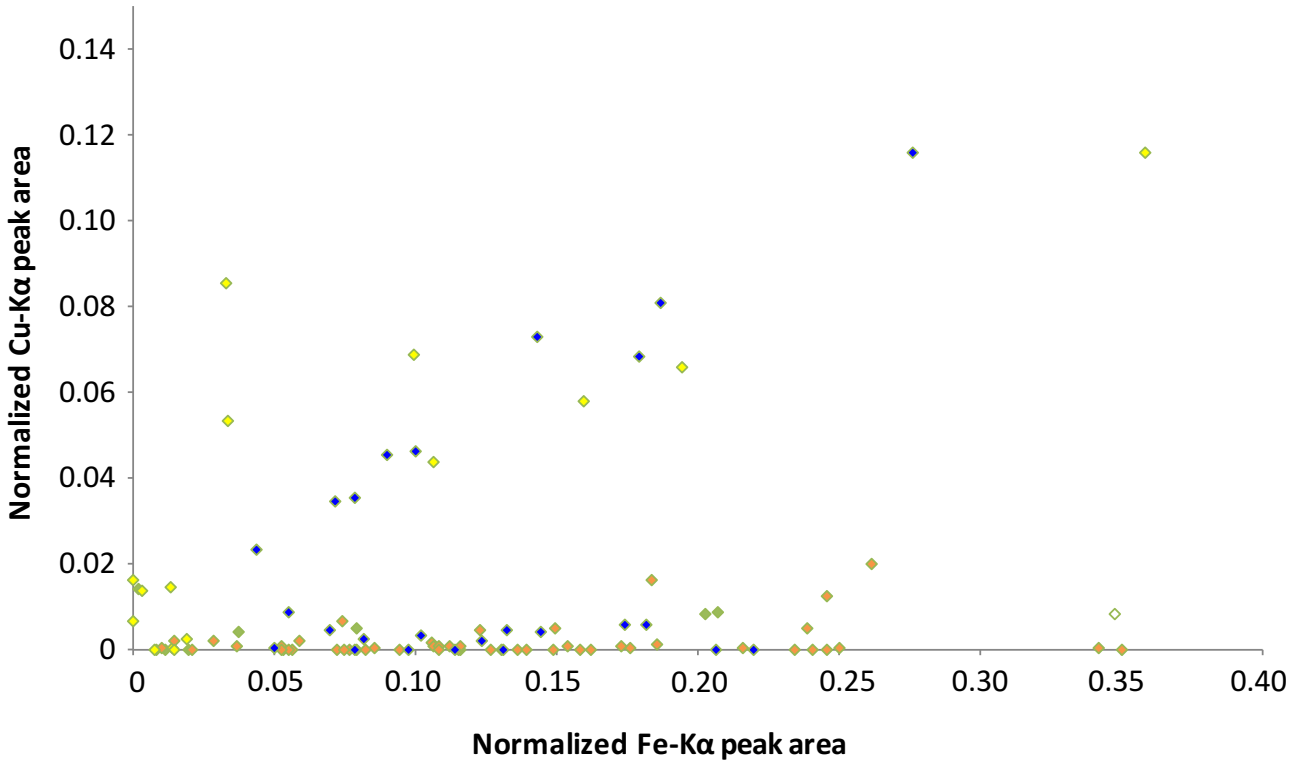


Figure 9. Element analyses of the wool samples from 1650-1850 (three measurements per sample): orange represent the 1650-1720 period, blue represent the 1720-1820 period, green represent the 1820-1850 period and yellow represent the 1850-1890 period.

Logwood

A derivative of hematoxylin was detected in thirty-nine of the fifty-one samples. It is a compound obtained by the acidic hydrolysis step used by one of the authors, in a previous paper [21], to recover the dyes from the fibres. Hematoxylin is a flavonoid molecule, the major dye molecule of logwood (*Haematoxylum campechianum* L.). This mordant dye became a very important ingredient for dyeing wool black in the seventeenth century. Its enormous popularity, rising from that moment up to the nineteenth-century, was based on technical advancements in the dyeing process, resulting in a much stable black dyeing with logwood, as well as on the rising importance of black clothing in nineteenth-century fashion [19, pp. 263-274].

Soluble redwood (sappan- or brazilwood)

Soluble redwood (*Caesalpinia* species), with brazilin as main dye molecule, was identified in five samples, based on the detection of urolithine C, a marker compound of any soluble redwood such as sappan- or brazilwood [40]. Redwoods were used to economise on the expensive madder [19, pp. 27, 42, 89; 22, p. 516].

Insoluble redwood (sandalwood)

In one sample, a santalin compound was detected, referring to the use of an insoluble redwood, such as red sandalwood (*Pterocarpus* species) [19, pp. 290-299].

Madder roots

The red anthraquinone dye compounds alizarin and purpurin are the main dye molecules indicative for dyeing with the roots of madder (*Rubia tinctorum* L.). In multiple samples, they were detected in the presence of minor dye molecules nordamnacanthal, rubiadin, xanthopurpurin, munjistin and anthragallol. Red mordant dyes from madder were identified in eighteen samples; in three of them in very small amounts.

Mexican cochineal

Evidence for the use of the scale insect red Mexican cochineal (*Dactylopius coccus* Costa) in the black wool samples was found only twice and in minor quantities. It was identified based on the detection of the dye molecule carminic acid. *Porphyrophora* scale insects such as Polish (*P. polonica* L.) and Armenian cochineal (*P. hamelii* Brandt) species also have carminic acid as their main dye molecule [41-42], but these species can be almost completely excluded on the basis of the nineteenth century context of the samples in which they were detected.

Luteolin-based yellow plant sources

Luteolin and apigenin are the main dye molecules from yellow dye plants such as weld (*Reseda luteola* L.), sawwort (*Serratula tinctoria* L.), chamomile (*Anthemis* species) and many other luteolin based yellow dye sources. In the presence of genistein as third marker molecule, the plant can be specified as dyer's greenweed (*Genista tinctoria* L.), while chrysoeriol as third dye compound is indicative for weld. Dyer's greenweed was found to be used in twelve samples [19, pp. 168-181].

Yellow dye woods (old and young fustic)

Dyes from the yellow dye plant old fustic, also known as dyer's mulberry *(Chlorophora tinctoria* L.), were detected in fifteen samples, based on the identification of the benzophenone compound maclurin and the flavonoid dye compound morin together, in some samples, with kampferol and quercetin. Only one sample showed the use of the yellow dye plant known as young fustic (*Cotinus coggygria* L.), out of the detection of the flavonoid molecules fisetin and sulfuretin [19, pp. 191-199].

Dye ingredients found in the well-dated historical textiles

Melijn Archive, Antwerp (1681-1714)

Although covering a narrow period of 33 years, the HPLC analyses show that the nature of black dyeing in most samples differs between the three archival books (Table 1). According to literature sources, dyers were allowed to dye a blue undertone with logwood during that period, followed by an overdyeing with tannin in combination of iron sulphates or acetates [22, p. 558]. When comparing and analysing the results, it is evident that many recipes with a combination of at least two to five organic ingredients were used to obtain the black colour. The detection of iron in most of the samples could indicate the use of iron salts.

In Book T94/183 (1681-1682), the main organic dye ingredients in nine out of ten samples are logwood and tannin. Apart from the main ingredients, different accompanying dyes were identified: red dyes from madder, yellow dyes from old fustic and blue dyes from indigo/woad. The analyses confirm a ground-dyeing with logwood, after which a nice black was obtained by the addition of tannins, red and yellow dyes, and most probably iron salts. The only dark brown coloured sample (W10) was also the only one not dyed with logwood, but by a combination of tannin and madder as main dye sources accompanied by yellow dyes from dyer's greenweed and old fustic.

The dark samples from the second Book T94/187 (1695) do not have logwood but indigo/woad and madder as the main dye ingredients, while tannin and yellow dyes from old fustic and dyers' greenweed are used as minor dyes, conceivably combined with iron salts. The main components detected in most of the samples of the third Book T94/189 (1712-1714) are logwood and madder.

Tannins are present, though not used as major dye source. Yellow dyes from old fustic and weld (or an equivalent luteolin-based dye source, see above) are found as minor ingredients, again perhaps combined with iron salts. Sample W27 is the only sample from this book dyed with logwood and tannin as the main biological sources, in the presence of weld, old fustic and an iron mordant – hence, according to a similar black dye procedure as applied in the samples of the first book T94/183.

The red dyes are dominant in the black samples from the last two books. Although the samples look black at first sight, it is very likely that these samples were dyed very deep brown.

The Insolvent Inventory from the City of Antwerp (1675-1777) comprises samples of black cloth and multi-coloured striped woollen fabrics from which the black yarns where analysed (Table 1). The dye analyses showed that there is a distinction between the dyeing procedures for the two types of yarns. Madder is the main ingredient of the black yarns from the striped fabrics (samples W68, W68a), while tannins forms the main biological source in the black fabrics (samples W32, W34 and W69).

In sample W68a from the first group, madder was applied on a blue undertone made with logwood and indigo/woad as minor ingredients, while sample W68 has both madder and tannin as main, and brazilwood and weld as minor ingredients. In the black cloths samples, tannins were used in combination with yellow dyes from weld (or equivalent), young fustic or old fustic, and possibly iron/copper salts and alum as mordants, as well as combined with red dyes from sandalwood, mordanted with iron and alum (sample W69). Of the samples examined in this study, dyes from young fustic and sandalwood were only encountered in this archive.

From the Crafts of Linen Weavers, Passementary and Ribbon Trimmings Archive (1700-1757), five black yarns sampled from striped fabrics were analysed. Tannin and logwood are found as the main ingredients, indicating a different dyeing procedure than found in the samples of the previously described striped textiles also dating from the eighteenth century (Table 1).

Samples W35 and W35b are dyed with logwood only, perhaps combined with iron and/or copper mordants. A more complex mixture of dyes was found in samples W35a and W60 with, respectively, tannin, logwood and madder, and tannin, logwood and weld as main ingredients, perhaps combined with iron and/or copper mordants. Sample W36 is the only sample from this archive that was not dyed with logwood, but with tannin and a trace of old fustic on an iron mordant.

The ingredients found correspond to the time frame of the samples, when dyeing wool with logwood and iron in combination with other ingredients to shade the wool was permitted.

In the Knijff Family Archive (1683-1696), tannins, only (sample W92) or together with brazilwood (sample W38a) or with logwood and madder (sample W38), are the main dye ingredients identified in this archive, while yellow dyes from dyer's greenweed and old fustic are present as minor ingredients, possibly combined with iron salts (Table 1).

The simple technique used to dye black in the nineteenth century is in sharp contrast to the complex methods used in the last quarter of the seventeenth and the eighteenth century. Unfortunately, this could only be deduced from the analyses of a few nineteenth century samples from the Industrial Tribunal Archive, dated from 1868, all dyed with logwood on an iron mordant (Table 1). However, it does correspond completely with information known from literature sources [21].

Historical samples attributed to a certain period

Two Anonymous sample books, Fashion Museum Antwerp

The two black yarns from the sample book dated to the first half of the eighteenth century have logwood and indigo/woad as main ingredients in sample W30, together with tannin and brazilwood as other important dye sources. Madder, weld, and old fustic were used as minor sources. Logwood was also the main ingredient of the samples from the second sample book dated from the first half of the nineteenth century. Other important dye sources used were dyer's greenweed (sample W59) and tannin (sample WT99/103). In the latter sample, cochineal, brazilwood, old fustic as well as indigo/woad were found as minor ingredients, while iron, copper and aluminium were detected which might refer to applied metal mordants. This complex mixture of organic dye sources and inorganic metal mordants detected in the last sample could be an indication of an over-dyeing of a previously incorrectly dyed fabric.

Anonymous Archive Municipal Museum Lokeren, (1870-1890)

Logwood is again the main ingredient of eight samples from the two sample books dated from 1870-1890. It was just not used in sample W77, which was dyed with mainly indigo/woad and tannin. In five samples, logwood was the only main dye source; in twice it was found in combination with indigo/woad and once with tannin. Brazilwood, madder, old fustic and indigo/woad were detected as minor ingredients and dyeing occurred most likely in the presence of iron/copper mordants.

The combination of both logwood and indigo together with red and/or yellow dyes, in this case madder or old fustic, was described by Cardon and is called *le noir de Sedan*. This method was used in the town of Sedan (Northern France) from the seventeenth century. It involved a combination of dyeing an undertone of indigo over-dyed with logwood in combination with sumac and copper mordant used in the *saddening bath* [19, p. 147].

In the currently brown-black sample W76, only a very small amount of the marker dye from logwood was found, without any other dye compounds, which might be explained by a lack or homogeneous application of an iron mordant on the fibres.

Historical artefacts

Two black samples from the bonnets and pieces of cloth from Agnes Baliques were dyed with logwood and iron (W81) or iron and copper as mordant (sample W82), while sample W80 was dyed with logwood, tannin and iron, and sample W79 with tannin in combination with indigo/woad and iron. The two last samples were likely dyed with tannin on an undertone made of, respectively, logwood and indigo/woad. The variations in dyeing recipes found in the few historical artefacts samples, all from the same provenance, are striking. No additional yellow or red dyes were detected, which might be a deliberate choice of the dyers or due to the more pronounced degradation of these textiles.

Conclusion

The ingredients identified by chemical analyses performed on the black and dark brown dyed woollen samples from the historical Belgian archives and artefacts are largely consistent with the ingredients mentioned in the historical recipes and regulations for the 1650-1850 period. A qualitative overview of the eleven biological dye sources found together with the frequency of detection is given in figure 10. This figure demonstrates that logwood and tannins (galls, sumac or others) are by far the most popular ingredients, found in, respectively, 37 and 36 out of the 51 historical samples analysed.

Even more variation than expected is found in dye ingredients by HPLC analysis of the historical samples from the historical sources. When considering only the main organic dye ingredients for black dyeing (logwood, tannin, indigo/woad and madder), many samples were dyed with a combination of two or three of these ingredients. Another important constant in the HPLC results is that multiple yellow and red dyes were often detected. Of the yellow dye sources, old fustic and dyer's greenweed were most frequently detected, followed by weld and young fustic, while madder, brazilwood (also called redwood), Mexican cochineal and sandalwood were identified (in decreasing frequency) as red dye sources. It is likely that these dyes have been added to the dye bath to obtain a specific black shade or to bridge colour differences due to the reuse of dye baths or to previously incorrectly dyed textiles.

There is no general pattern of evolution in ingredients used over time. Logwood, indigo/woad, madder and tannin were used interchangeably during the 1680-1850 period. However, apart from one exception (sample W77), dye recipes without logwood only occur until the end of the eighteenth century.

Iron was detected frequently, perhaps indicative for the use of iron salts. Furthermore, iron was detected much more often than copper, or mixtures of both ingredients. The use of an iron-based mordant with a higher copper content was only noticed in the eighteenth and nineteenth century (in 1720-1820 and 1850-1890) (Figure 9).

The identified organic and inorganic ingredients from the analyses of the historical samples made it possible to situate the samples among the three main types of dyeing that can be distinguished from the written sources (Figure 11).

Dye recipes from type I with indigo and madder as main ingredients (without any addition of logwood) are rather rare. In fact, they were only detected in four samples from Book T94/187 from the Melijn archive dated from

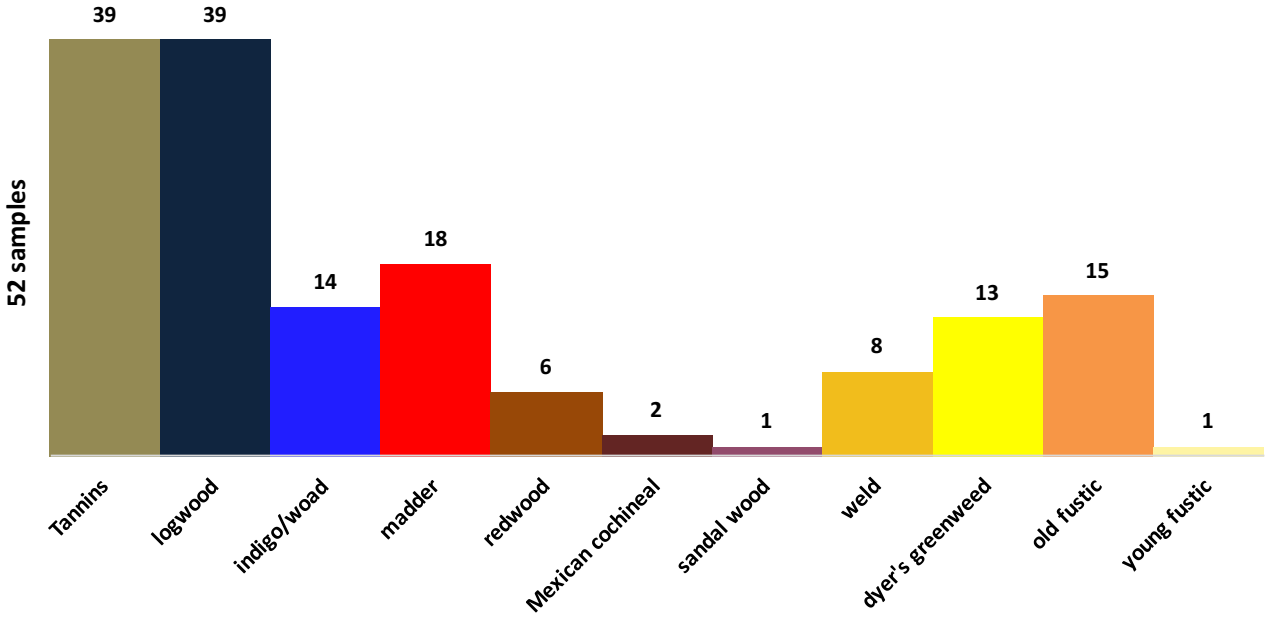


Figure 10. Biological sources in black dyed wool, 1650-1850.

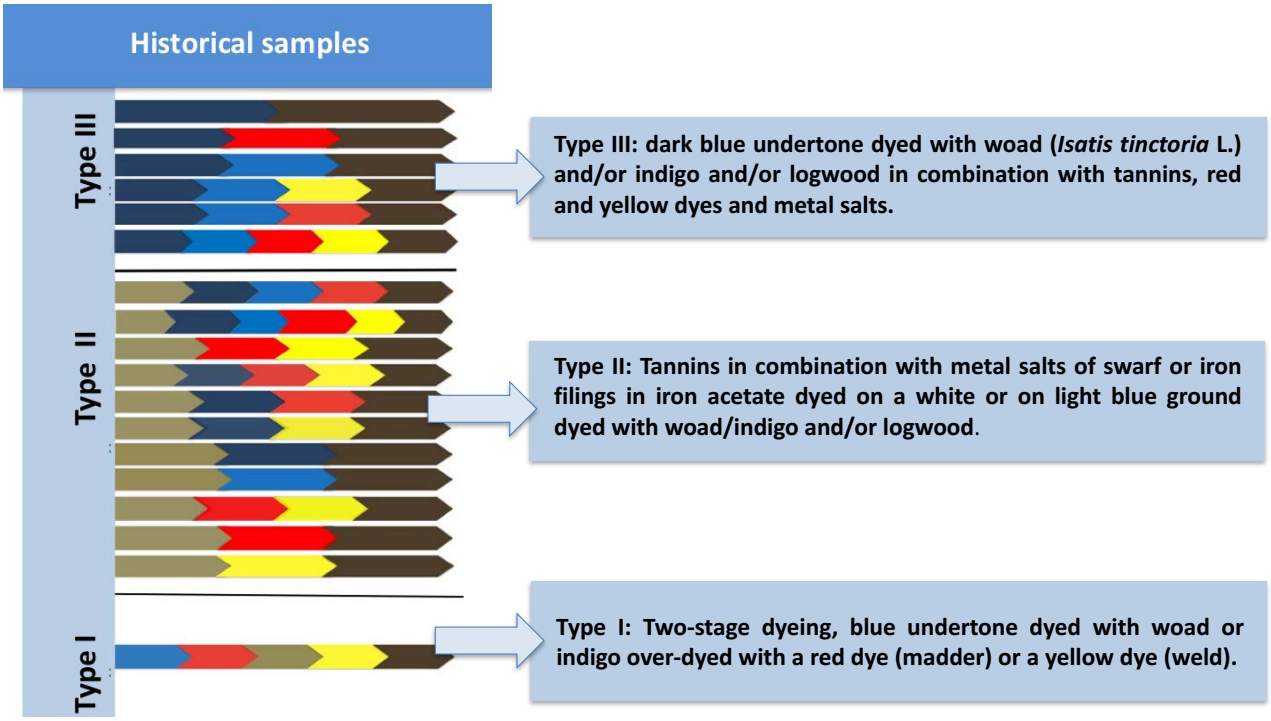


Figure 11. Typology of dyeing recipes based on the organic and inorganic ingredients identified in the historical woollen samples from the Belgian Archives (1650-1850).

1695. Black dyeing with tannin and metal salts (without the addition of logwood) (type II) was detected more frequently, mostly in combination with red dyes and/or yellow dyes and only twice in combination with indigo/woad alone. The dye recipes in which indigo/woad and/or logwood were used as blue undertone followed by a second dyeing with tannin together with red and/or yellow mordant dyes, likely also combined with metal salts (type III), were encountered regularly during the whole considered period. They provide clear evidence that dyeing black was even more complicated than literature suggests.

It is certain that the black dyers must have had very good technological skills in order to obtain the specific black shade in question with so many different ingredients, taking into account the possible quality variations of each of these natural raw materials.

Acknowledgements

The authors would like to thank Wim Mertens, curator of the Fashion Museum Antwerp, Anita Quye, Centre for Textile Conservation and Technical Art History, University of Glasgow, and the research group Heritage & Sustainability of the University of Antwerp. Further thanks are due to the archivists and conservators of the Municipal Museum Lokeren, City Archive Antwerp, Belgian National Archive, Fashion Museum Antwerp and Convent of the Women Apostles of Antwerp.

ORCID

Ina Vanden Berghe
https://orcid.org/0000-0002-2053-6000

Olivier Schalm
https://orcid.org/0000-0001-8705-7293

References

1 Ortega Saez, N., 'Black dyed wool in North Western Europe, 1680-1850: The relationship between historical recipes and the current state of preservation', PhD-thesis, University of Antwerp (2018).

2 Braeckman, W. L., *Middelnederlandse Verfrecepten Voor Miniaturen en 'Aller- Hande Substancien'*, Scripta, Gent (1986).

3 Brunello, F., *The Art of Dyeing in the History of Mankind*, Neri Pozza, Vicenza (1973).

4 Albo, J., *Instructions Générales Pour la Teinture des Laines et des Manufactures de Laine de Toutes Couleurs et Pour la Culture des Drogues ou Ingrediënts qu'on y Emploie*, Paris (1671).

5 De Beunie, J. B., *Antwoord op de Vraege*, Brussels (1772).

6 De Nie, W. L. J., 'De ontwikkeling der Noord-Nederlandsche textielververij van de veertiende tot de achttiende eeuw', thesis, Leyden (1937).

7 De Poerck, G., *La Draperie Médiévale en Flandre et en Artois. Technique et Terminologie*, 3 vols., De Tempel, Bruges (1951).

8 Dieu, M., 'Het verven der goederen te Leuven', *De Brabantsche Folklore* **11** (1932) 146-150.

9 Edelstein, S. M.; Borghetty, H. C. (transl.), The Plictho. *Instructions in the Art of the Dyers Which Teaches the Dyeing of Woolen Cloths, Linens, Cottons, And silk by the Great Art as Well as by the Common*, The M.I.T. Press, Cambridge (1969).

10 Edelstein, S. M., 'The Allerley Matkel – Study of earliest printed book on spot removing and dyeing', *American Dyestuff Reporter* **54** (1965) 297-321.

11 Edelstein, S. M., 'Dyeing fabrics in sixteenth-century Venice', *Technology and Culture* **7** (1966) 395-397, https://doi.org/10.2307/3101938.

12 Frencken, H. G. T., 'T Bouck và wondre (1544, Antwerp, Cock)', PhD dissertation, University of Leiden (1934).

13 Grison, T., *La Teinture au Dix-neuvième Siècle: en Ce qui Concerne la Laine et les Tissus ou la Laine est Prédominante*, 2 vols., Paris (1884).

14 Hellot, J., *Art de la Teinture des Laines et des Etoffes de Laine en Grand et en Petit Teint*, Paris (1750).

15 Partridge, W., *A Practical Treatise on Dying of Woollen, Cotton and Skein Silk: with the Manufacture of Broadcloth and Cassimer*, Walker & Co., New York (1823).

16 Ploss, E. E., *Ein Buch von alten Farben, Technologie der Textilfarben im Mittelalter mit Einem Ausblick auf die Festen Farben*, Impuls Verlag Heinz Moos, Heidelberg (1962).

17 Schweppe, H., *Handbuch der Naturfarbstoffe, Vorkommen, Verwendung, Nachwei*s, Ecomed, Landsberg–Lech (1992).

18 Munro, J., 'Necessities and luxuries in early-modern textile consumption: real values of worsted says and fine woollens in the sixteenth century Low Countries', in *Cities, Coins, Commerce: Essays Presented to Ian Blanchard on the Occasion of his 70th Birthday*, ed. P. R. Rössner, Franz Steiner, Stuttgart (2012) 121-147.

19 Cardon, D., *Natural Dyes: Sources, Tradition, Technology and Science*, Archetype, London (2007).

20 Hofenk De Graaff, J. H., *The Colourful Past, Origins, Chemistry and Identification of Natural Dyestuffs*, Archetype Publications, London (2004).

21 Takami, M.; Vanden Berghe, I., 'Caring for Queen Victoria's Privy Council dress c.1837: an investigation of the unique discolouration of the black silk', *e-Preservation Science* **10** (2013) 42-49.

22 Quye, A.; Hallett, K.; Herrero Carretero, C., *Wroughte in Gold and Silk. Preserving the Art of Historic Tapestries,* National Museums of Scotland, Edinburgh (2009).

23 Thijs, A. K. L, 'Van 'werkwinkel' tot 'fabriek'. De textielnijverheid te Antwerpen van het einde der vijtiende tot het begin der negentiende eeuw', PhD thesis, Antwerpen (1987).

24 Saverwyns, S.; Vanden Berghe, I., 'Separation techniques in archaeometry', in *Analytical Archaeometry. Selected Topics*, ed. H. Edwards & P. Vandenabeele, RSC Publishing, Cambridge (2012) 132-162, https://doi.org/10.1039/9781849732741-00132.

25 Degano, I.; Ribechini, E.; Modugno, F.; Colombini, M. P. 'Analytical methods for the characterization of organic dyes in artworks and in historical textiles', *Applied Spectroscopy Reviews* **44** (2009) 363-410, https://doi.org/10.1080/05704920902937876.

26 Petroviciu, I.; Vanden Berghe, I.; Cretu, I.; Albu, F.; Medvedovici, A., 'Identification of natural dyes in historical textiles from Romanian collections by LC-DAD and LC-MS (single stage and tandem MS)', *Journal of Cultural Heritage* **13** (2012) 89-97, https://doi.org/10.1016/j.culher.2011.05.004.

27 Surowiec, I.; Quye, A.; Trojanowicz, M., 'Liquid chromatography determination of natural dyes in extracts from historical Scottish textiles excavated from peat bogs', *Journal of Chromatography A* **1112** (2006) 209-217, https://doi.org/10.1016/j.chroma.2005.11.019.

28 Vanden Berghe, I.; Gleba, M.; Mannering, U., 'Towards the identification of dyestuffs in Early Iron Age Scandinavian peat bog textiles', *Journal of Archaeological Science* **36**(9) (2009) 1910-1921, https://doi.org/10.1016/j.jas.2009.04.019.

29 Mantzouris, D.; Karapanagiotis, I.; Valianou, L.; Panayiotou, C., 'HPLC-DAD-MS analysis of dyes identified in textiles from Mount Athos', *Analytical and Bioanalytical Chemistry* **399** (2011) 3065-3079, https://doi.org/10.1007/s00216-011-4665-4.

30 Gleba, M.; Vanden Berghe, I.; Aldenderfer, M., 'Textile technology in Nepal in the 5th-7th centuries CE: the case of Samdzong', *Science & Technology of Archaeological Research* **2**(1) (2016) 1-11, https://doi.org/10.1080/20548923.2015.1110421.

31 Kramell, A.; Li, X.; Csuk, R.; Wagner, M.; Goslar, T.; Tarasov, P. ; Kreusel, N.; Kluge, R.; Wunderlich, C.-H., 'Dyes of late Bronze Age textile clothes and accessories from the Yanghai archaeological site, Turfan, China: Determination of the fibres, colour analysis and dating', *Quaternary International* **348** (2014) 214-223, https://doi.org/10.1016/j.quaint.2014.05.012.

32 Wouters, J., 'A new method for the analysis of blue and purple dyes in textiles', *Dyes in History and Archaeology* **10** (1992) 17-21.

33 Koren, Z., 'A new HPLC-PDA method for the analysis of Tyrian Purple components', *Dyes in History and Archaeology* **21** (2008) 26-35.

34 Karapanagiotis, I., 'Identification of indigoid natural dyestuffs used in art objects by HPLC couple to APCI-MS', *American Laboratory* **38**(3) (2006) 36-40.

35 Mantzouris, D.; Karapanagiotis, I.; Panayiotou, C., 'Comparison of extraction methods for the analysis of Indigofera tinctoria and Carthamus tinctorius in textiles by high performance liquid chromatography', *Microchemical Journal* **115** (2014) 78-86, https://doi.org/10.1016/j.microc.2014.02.010.

36 Karatzani, A., 'Study and analytical investigation of metal threads from Byzantine/Greek ecclesiastical textiles', *X-Ray Spectrometry* **37** (2008) 410-417, https://doi.org/10.1002/xrs.1021.

37 Melijn Archive, Fashion Museum Antwerp (1681-1714).

38 De Ridder L., *De Godminnende Agnes Baliques, Stichtster der Vergadering der Dochters van de Onbevlekte Ontvangenis der Allerheilige Maagd en Moeder Gods Maria (Genaamd Apostellinnen)*, Algemeen Rijksarchief, Brussel (1996).

39 Ortega Saez N., *The Technology of Black Dyeing, Exhibition catalogue Masters of Black in Fashion & Costume*, MOMU Antwerp (2010).

40 Peggie, D. A.; Kirby, J.; Poulin, J.; Genuit, W.; Romanuka, J.; Willis, D. F.; De Simone, A.; N. Hulme, A., 'Historical mystery solved: a multi-analytical approach to the identification of a key marker for the historical use of brazilwood (Caesalpinia spp.) in paintings and textiles', *Analytical Methods* **10** (2018) 617-623, https://doi.org/10.1039/C7AY02626A.

41 Wouters, J.; Verhecken, A., 'The Coccid insect dyes. HPLC and computerized diode-array analysis of dyed yarns', *Studies in Conservation* **34** (1989-1990) 189-200, https://doi.org/10.1179/sic.1989.34.4.189.

42 Vanden Berghe, I., 'The identification of cochineal species in Turkmen weavings; a special challenge in the field of dye analysis', in *Turkmen Carpets. A New Perspective*, ed. Jürg Rageth, Freunde des Orientteppichs, Basel (2016) 303-310, 333-348.

Received: 2018-6-17
Revised: 2018-12-20
Accepted: 2019-1-4
Online: 2019-3-10

Estudos sobre têxteis históricos
Studies in historical textiles
A. Serrano, M. J. Ferreira, E. C. de Groot (ed.)

Article / Artigo

Knitting comes of age: the development of a scientific approach to the study of knitwork

Jane Malcolm-Davies

Centre for Textile Research, University of Copenhagen, Karen Blixens Plads 8, Copenhagen 2300, Denmark
jane@jmdandco.com

Abstract
Knitting has received scant attention in the scientific study of textiles despite its continued popularity as a handicraft. As a result, relatively little is published about the evidence for early knitting. It is frequently the victim of mistaken identity: items made by needle binding are often described as knitted; and many more items which are knitted remain unidentified as such. A draft protocol inspired by the Centre International d'Étude des Textiles Anciens' system for the analysis of woven textiles has been developed as part of a project to investigate Knitting in Early Modern Europe (KEME). A lack of unambiguous terminology was also identified as a challenge to the scholarly scrutiny of knitting's origins. The evolution of a protocol and terminology and their application to a collection of knitted caps from the sixteenth century (now published online) is reported here.

Keywords
Textile analysis
Knit
Cap
Early Modern
Terminology
Database

O tempo do tricot: desenvolvimento de uma abordagem científica para o estudo de malhas

Resumo
O trabalho em tricot tem recebido reduzida atenção no que toca ao seu estudo como objecto têxtil, apesar da sua popularidade como trabalho artesanal. Por conseguinte, relativamente pouco tem sido publicado sobre os testemunhos antigos do tricot. O tecido de malha é frequentemente vítima de equívocos: objectos produzidos em binding needle são, por vezes, descritos como malha; outros objectos em malha continuam por ser identificados como tal. Um projecto de protocolo para a análise de tecidos, inspirado no sistema do Centre International d'Étude des Textiles Anciens, foi desenvolvido no contexto do projecto Knitting in Early Modern Europe (KEME). A necessidade de terminologia inequívoca foi identificada neste projecto como um desafio no que toca à análise académica das origens do tricot. O desenvolvimento de um protocolo e de uma terminologia e a sua aplicação no estudo de uma colecção de gorros tricotados do século XVI (disponível online) é apresentado aqui.

Palavras-chave
Análise têxtil
Tricot
Gorro
Idade Moderna
Terminologia
Base de dados

ISSN 2182-9942

Conservar Património **31** (2019) 133-143 | https://doi.org/10.14568/cp2018034
ARP - Associação Profissional de Conservadores-Restauradores de Portugal
http://revista.arp.org.pt

Introduction

Knitting is the little sister and poor cousin of textile history. It is a much more recent craft activity than other methods of textile construction such as knotting and weaving, which are millennia older. Despite this relatively short and recent history, knitting has had far fewer resources devoted to its material evidence and historical context than other textile crafts. This is surprising given its continued widespread and growing popularity as a serious leisure pursuit [1]. Ravelry, the premier online hub for knitting enthusiasts, has more than four million members registered on its website. At least 25 of the subgroups within Ravelry pursue an active interest in historical knitting, including the study of sheep and yarn, and how to knit reconstructions of historical objects.

One of the aims of Knitting in Early Modern Europe (KEME), a European Union-funded research project, was to assess how this major gap in the development of textile scholarship might be addressed [2]. A far-flung collection of sixteenth century knitted caps (in museum collections from Copenhagen in the north to Croatia in the south) was the focus of the study. Many of these caps were excavated more than 100 years ago, accessioned with very little information about their archaeological contexts, and then stored with almost no further investigation [3]. KEME's main outcome was the development of an online database intended to showcase the collection as a newly gathered family of objects [4]. The intention was to record their singular and common characteristics to facilitate further study of them as evidence for early modern knitting.

A major challenge to the collection and curatorship of the digital collection was the lack of a conventional way of recording knitted textiles. Previous publications of knitted artefacts offer scant or ambiguous descriptions. Very few provide detailed insight into the materials, construction or current condition of the items – with a few notable exceptions, including one undergraduate thesis [5]. Examples of less than comprehensive reports are: the publication of a significant early 17th century fragment of knitted fabric (see Figure 1), excavated in a latrine in Lüneburg (Germany), which concentrates on a crystalline deposit on the fragment without reporting basic dimensions such as gauge [6]; "fragments of coarse knitting" from the 16th century described as made from plied yarn from a hairy medium fleece from an excavation in Reading (United Kingdom) [7]; and a much-cited source which records 16th century knitted items in the Museum of London collection with the "stitches [wales] per inch" (the horizontal measurement) but not the courses (the vertical measurement) [8].

A necessary requirement of publishing the collection online was a systematic approach to measuring, investigating and recording the material which would facilitate scientific comparison and generate new insights into their historical production. One indication of the urgent need for such a system is the recent publication of archaeological material unconvincingly presented as evidence for Early Bronze Age "two-needle knitting" [9]. This would date knitting's origins to more than five millennia earlier than current scholarly evidence suggests. Methodological flaws, including a failure to define the fabric structure and the terms used to discuss it, contribute to the confused arguments presented.

Figure 1. Fragment of knitwork measuring 11.5 cm × 8 cm from an early 17th century latrine in Lüneburg, Germany [6]. Image courtesy of Lüneburger Stadtarchäologie.

Literature

Existing publications which describe knitting in clear terms tend to be manuals on how to do it. Several are exemplary in their use of language despite the difficulties posed by cultural and geographical differences in the way knitting is done and how the processes are named [10-11]. The emphasis in these publications is on communicating methods of knitting not on describing the finished product.

Even the best overviews of knitting history are inconsistent and uncomprehensive in their descriptions of extant artefacts, although the more recent benefits from excellent colour photographs, which are largely lacking from earlier works [12-13]. Some discussions of specific artefacts provide historical context but lack accurate and adequate detailed description [14-15].

Woven textiles may be analysed according to several conventional systems, the most widely accepted of which is published and taught by the Centre International d'Étude des Textiles Anciens (CIETA) in Lyon, France [16]. This served as inspiration for the development of a similar system for knitted objects.

Good practice in terminological work is based on an analysis of the relevant concepts, the identification of appropriate terms to assign to these concepts, and the development of definitions. In this case, there is also a need for the creation of new terms and for translation into other languages [17]. A variety of terms representing the concepts may be synonymous and it is not always necessary to have prescriptive terminology or to outlaw

previously used terms which convey meanings for specific concepts in other contexts.

Published knitting instructions, for example, serve a different purpose to museum catalogues. Conventions used in instructions rely on a cultural understanding of the practice of knitting and, aside from the language in which the instructions are written, require translation from word to action. Knitters learn that words may need interpretation across geographical and cultural conventions. Their priority is finding the appropriate actions to create/recreate a knitted item.

A new scholarly language for recording the evidence for knitting should be authoritative but need not become the standard in other contexts. The requirement in an academic context is to describe the items accurately in a way that may be understood by scholars. There is no need for words to translate into actions. Indeed, the difference between description and prescription is key. The language used cannot therefore rely on the practical expertise of an experienced knitter or the understanding that words may mean one thing in one place and another elsewhere.

A collaborative team embarked on the task of developing a convention for recording knitted items and a terminology for accurately describing them. The team included textile archaeologists, dress historians, textile terminologists and conservators, as well as knitters – both professionals and hobbyists. The protocol was designed to record the basic details of knitted fragments and the collection of knitted caps under investigation in KEME. Much of the evidence for early knitting is simple in construction and often fragmentary and therefore does not require the complex vocabulary necessary for later evidence. It is anticipated that the protocol and terminology will develop and grow to accommodate more sophisticated knitted items dating from later eras in the future.

Challenges

Stitch is a problematic word in the description of knitting. It better describes the action rather than the outcome. It is also the word used to describe a sewn stitch and is therefore ambiguous when applied to a knitted fabric, which may carry sewn stitches as seams or embellishment. Loop (a word employed in the modern knitting industry) is a better term for the purpose (see Table 1 for the proposed terminology) [10-11, 18-22]. The loops are usually referred to as knit/plain or purl stitches and are recognised as V-shaped or ridged in appearance. But a right/plain/knit stitch and a left/purl stitch produce exactly the same result – what differs is the loop's relationship to the face of the fabric. It is not possible to say with any certainty which surface of a fabric was facing the knitter when it was under production or which way the knitter was working – from left to right or right to left [23]. Therefore, it is necessary to refer to face loops and reverse loops in the description of the fabric to avoid potentially erroneous assumptions (see below).

Another difficulty presented by fragmentary evidence is that it is not possible to know whether it was produced by knitting round on more than two needles or back and forth on two. The fragment may be the remains of a tube or a flat piece of fabric. Round knitting consists of *rounds* and back and forth knitting consists of *rows*. These terms therefore imply the way in which the fabric was constructed and are inadequate for accurate description. The new terminology proposes *course* (another term used in the modern knitting industry).

One of the other major challenges to the development of a conventional system for recording knitwork was the need to separate assumptions about how an artefact was knitted from a description of what actually remains. Many of the common terms (in English and their equivalents in other languages) imply the method of construction. Stocking stitch, stockinet[te] and jersey, for example, are all terms conventionally used to describe knitted fabric with face loops exclusively on one surface and reverse loops exclusively on the other. Stocking stitch may be produced by employing knit/plain stitches throughout the work when working round or by alternating between plain/knit and purl courses in back and forth knitting. Artefacts with this arrangement of knitted loops is identified as *simple knit* (see Figure 2 for an Early Modern split-brimmed cap in simple knit [16, 24]) in the proposed terminology, which also includes a new term for what would be called *garter stitch* in back and forth knitting – *single ridge knit*. Using this term avoids the assumption that an item with this arrangement of loops was necessarily knitted back and forth rather than round [25].

Another challenge is the ambiguity of terms such as right/wrong sides versus right/left sides of the fabric. New terms are proposed for what is designated the side intended to be seen in wear (the recto) and the other side (the verso) [25]. Sometimes, the side intended to be seen may be determined by convention and by reference to contemporary pictorial representations of garments – as,

Figure 2. A split-brimmed knitted cap in simple knit fabric at the Victoria & Albert Museum, London (inventory number 1566-1901).

Table 1
Summary of concepts and proposed key terms for reporting archaeological and historical knitwork [10-11, 18, 20-22]

Concept		Discussion points, variables, references	Proposed term (English)
Tool	Needles (two or more than two)	Sticks, pricks, wires, pins	Needles (plural)
		Double-pointed	
		Single-pointed	
Material	Yarn	Applies to all fibres [20, p. 10]	Yarn
	Fibre	Animal, plant, mineral or synthetic [20, pp. 4-5]	Fibre
	Fibre or yarn as structural element	Element [20, p.8]	Element
Element structure	Single (spun or not spun)	[20, p.8]	Single
	Spin/twist direction	[20, p.11]	Spin (S, Z) for single yarn; twist for plied
	Spin/twist angle (degrees from vertical)	[20, p.11]	Spin angle for single yarn; twist angle for plied
	More than one (spun or not spun) combined or plied	[20, p.8]	Compound
	Compound (spun or not spun) but not twisted together	[20, p.8]	Combined (I)
	Compound and twisted together	[20, p.10]	Plied (S, Z)
	Ply	[20, p.10]	Ply
	Number of single yarns	[20, p.11]	2- ply, 3- ply etc
	Additional twist	Re-plied [20, p. 11]/cabled [21]	Cabled
Method of working	In a continuous spiral	Knitted in rounds	Round
	Back and forth in the same plane – including turned/not turned	Straight rows [22]	Back and forth
Form	Form of item	Tubular, conical, discoid, "square, rectangular, or otherwise shaped" [20, p. 30]	As appropriate
Orientation	Top/bottom		Top/bottom
Fabric features	Starting edge	Casting on or binding on [10, p. 656]	Cast-on edge
	Finishing (locking) edge	Casting offf or binding off [10, p. 656]	Cast-off edge
	Unfinished edge	Cut/torn/decayed	Edge
	Turning edge	Secure edge [18, p. 3.3.2]	Selvedge
	Loop	Stitch	Loop
	Column/s of vertically aligned loops		Wale/s
	Course/s of element through horizontally aligned loops		Course/s
	Gauge (US)/Tension (UK)		Gauge
		Wales × courses per 10 cm square or inch square	Loop density
		(W per cm × YD) + (C per cm × YD) minus (W per cm × YD) × (C per cm × YD), where W is wales, C is courses and YD is yarn diameter	Cover factor

Table 1 ***(continued)***

Concept		Discussion points, variables, references	Proposed term (English)
Fabric features	Surface of fabric	Right/wrong sides	Recto/verso
	Surface of item	Inside/outside	Inside/outside
	Flat side or worked loop	Right/knit/plain stitch in fabric	Face loop
	Ridge side or worked loop	Left/purl stitch in fabric	Reverse loop
	Shaping	Addition of wale/s	Increase (noun)
		Removal of wale/s	Decrease (noun)
	Start/finish of round	Step/jog [10, p. 32; 11, p. 31]	Jog
	Decoration worked as part of fabric structure, whether loop formation or colour changes	Stitch patterns [11, p. 19]; decorative stitch technique [10, p. 660]	Stitch/colour pattern
	Decoration applied to the fabric	Ornamentation	Embellishment
Fabric structure (as observed)	One surface exclusively of face and the other exclusively of reverse loops	Plain/Stockinet[te]/Jersey	Simple knit fabric
	Two surfaces each of alternate courses of face and reverse loops	Garter stitch	Single ridge knit fabric
	Enumerated courses of face/reverse loops		Ridge fabric
	Two surfaces of alternate wales of face and reverse loops	Single rib	Single rib fabric
	Enumerated wales of face/reverse loops		Rib fabric
	Fabric made with two elements of the same yarn in various configurations, one working and one carried across either surface of fabric		Twined knit
Finish			Matted
			Fulled
			Napped
			Shorn
Colour			Pigmented
			Dyed
Process/ action	Construction of fabric	Knit	Work
Descriptor			Knitted
Product		Under construction/finished	Knitwork

for example, with a stocking or a fragment of one. One surface consists entirely of face loops and consequently the other surface is of reverse loops. Usually, knitted legwear is worn with the face loops on the outside and the reverse loops on the inside (see Figure 3 for the recto and verso of an 18th century stocking). Thus, the surface of face loops is the recto and the surface of reverse loops is the verso. It is much more difficult to designate recto/verso when fragments are less obviously part of a garment. In these cases, it is recommended that one surface be designated the recto in order to make further description feasible.

Other essential descriptions for understanding a knitted fabric include the number of loops in both the horizontal and vertical directions. These are recorded according to the protocol as courses per 10 cm (or inch) and wales per 10 cm (or inch), respectively, in the same way as the gauge of knitted fabric is recorded industrially. These measurements permit further useful ratios, such as the fabric's density and cover factor, to be calculated,

Figure 3. Fragment of a knitted stocking dated 1690 to 1770 excavated at Maersks Hovedsaede, Esplanaden, Copenhagen (KBM 2307), showing recto (surface with v-shaped loops worn on the outside) and verso (surface with ridge-shaped loops worn on the inside).

thereby permitting comparisons between different knitted items.

Application of the protocol

The development of the online database of knitted caps preceded the detailed terminological work and therefore does not demonstrate its application in full. It does, however, record all the recommended basic dimensions with the gauge and yarn diameter for each cap. There are also photographs and microscope images providing information indicative of the fabric's characteristics, which, in most cases is simple knit throughout (see Figure 4 for an example of a database entry for a 16th-century knitted cap lining).

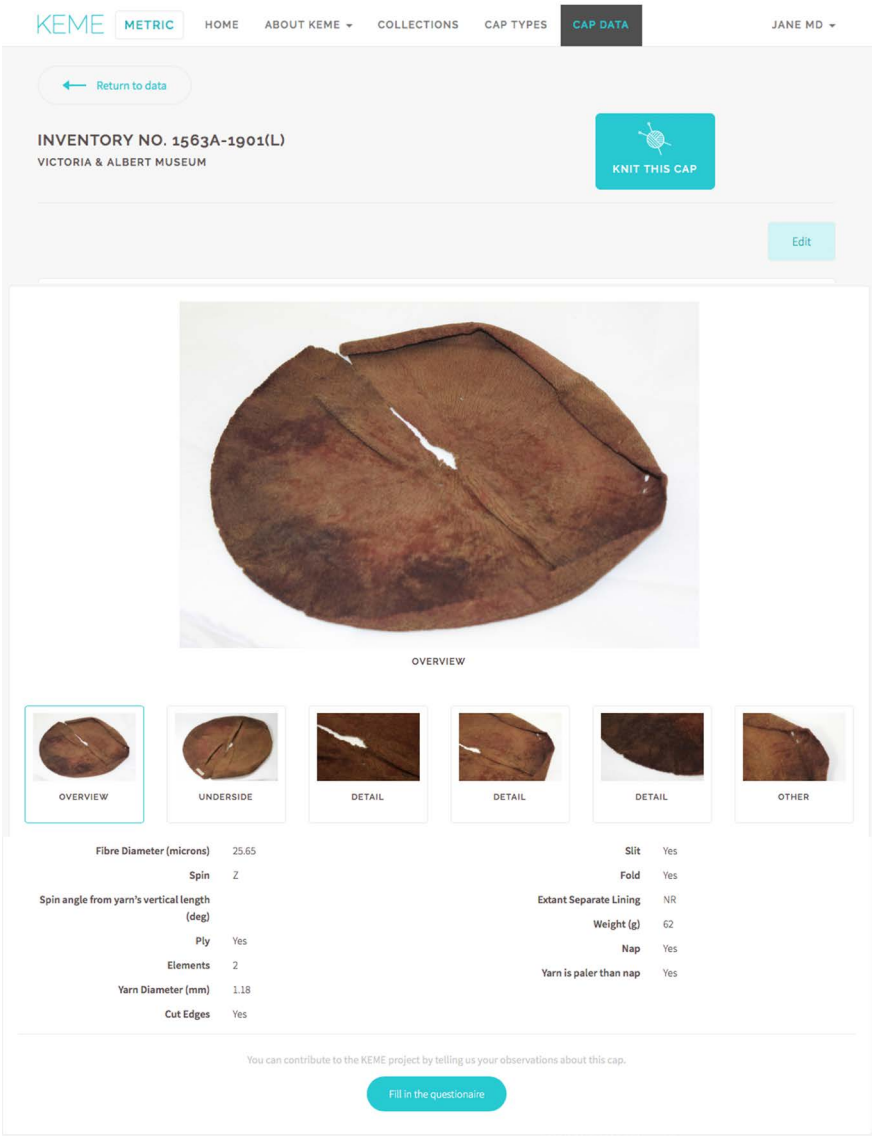


Figure 4. KEME database entry for a knitted cap lining at the Victoria & Albert Museum, London (inventory number 1563-1901) showing fibre diameter based on scanning electron microscope measurements (average of 100) and yarn diameter based on Dino-Lite USB microscope measurements (average of 10). Photograph by Jane Malcolm-Davies; image courtesy of the V&A Museum.

Table 2
Proposed *dossier de recensement* or protocol for recording archaeological and historical knitwork [16, 24]

Allow two to three hours for a thorough examination and detailed recording.
Work in metric or imperial measurements throughout.
Note whether measurements are approximate or precise.

1	Item identification
	Location where the item is currently held
	Inventory/accession number
	Object name (in official record)
	Source/find location (if known)
	Provenance (if known)
2	Item material & yarn structure
	Details of each yarn, including those in structure and sewing or embellishment, as follows:
	Fibre: animal, plant, mineral, synthetic (wool, silk, linen, cotton, metal, acrylic etc)
	Fibre diameter (in microns based on 100 measurements, if possible)
	Yarn diameter based on at least 10 measures with range stated
	Yarn analysis, as follows:
	Single or compound elements
	If compound, combined, plied or cabled
	If compound, number of single component yarns
	For each yarn:
	Single yarn diameter/s based on at least 10 measures with range stated
	Single yarn spin (Z, S, I) "I" indicates no visible spin
	Single yarn spin angle/s (0-45 degrees) based on at least 10 measures with range stated
	Plied yarn diameter/s based on at least 10 measures with range stated
	Ply twist/s (Z, S, I)
	Ply angle/s (0-45 degrees) based on at least 10 measures with range stated
	If cabled, number of plied yarns, twist & twist angle based on at least 10 measures with range stated
3	Fabric structure
	One yarn:
	Simple knit (yes/no)
	Single ridge (yes/no)
	Ridge knit (with enumerated courses of face/reverse loops)
	Single rib (yes/no)
	Rib fabric (with enumerated wales of face/reverse loops)
	Other combination of face and reverse loops (with chart/diagram, as necessary)
	More complex structures (with chart/diagram, as necessary)
	More than one yarn:
	Twined knit (yes/no)

Table 2 ***(continued)***

4	Fabric features
	Surface designated recto with reason (with chart/diagram as necessary)
	Surface designated verso with reason (with chart/diagram as necessary)
	Designated working direction with reason
	Loop height (average based on a minimum of 10 loops)
	Loop width (average based on a minimum of 10 loops)
	Gauge: count wales and courses, as follows:
	Wales (count horizontally) per 10 cm or inch
	Courses (count vertically) per 10 cm or inch
	Course to wale ratio = course count divided by wale count expressed as n:1
	Loop density = wales x courses per 10 cm square or inch square
	Cover factor = (W per cm × YD) + (C per cm × yd) minus (W per cm × YD) x (C per cm × YD) W refers to wales, C to courses and YD to yarn diameter.
	Cast-on edges (yes/no & description)
	Cast-off edges (yes/no & description)
	Selvedges
	Cut edges (yes/no & description)
	Torn edges (yes/no & description)
	Decayed edges (yes/no & description)
	Shaping: number of increases (locations & type/s – cite evidence in full)
	Shaping: number of decreases (locations & type/s – cite evidence in full)
	Embellishment
5	Item form & construction
	Form/s: Tube – (two edges, two surfaces) or plane (one edge, two surfaces) Shape/s (disc, square, rectangle, triangle, otherwise etc) with diagram, as necessary
	Designated top/bottom with reason
	Dimensions of item (with diagram, as necessary), as follows:
	Length (maximum/minimum, if appropriate)
	Width (maximum/minimum, if appropriate)
	Depth (maximum/minimum, if appropriate)
	Designated inside
	Designated outside
	Weight (grams or ounces)

A pilot database was published online in May 2018 with invitations issued to a citizen science team of volunteers (the KEME Team) to visit and comment on the material via a linked questionnaire. The purpose of recruiting a team was to track the usefulness of the protocol in making detailed information available to an identified user group, the members of which are now helping to refine it. The database was updated in August 2018 to include 68 of the 100+ knitted caps included in the KEME project.

The 168 volunteers who signed up to participate in experimental archaeology as well as online activities were among the first adopters of the database, although the invitation brought many more visitors in the first six

Table 2 ***(continued)***

6	General overview
	Finish: Matted (yes/no)
	Finish: Evidence of fulling, napping, shearing (yes/no & description of evidence)
	Colour/s: Archaeological brown – yes/no (light, dark, further details)
	Colour/s: Munsell, CIELAB or a similar colour recording system definition
	Natural pigmentation (yes/no & description)
	Dyed (yes/no & description)
	Sewn seams, fastenings, evidence of wear or use, damage, repairs, mistakes/anomalies, marking, additions, writing, evidence of conservation work
	Further observations (including number of parts, pattern sections, shaping, seams, hems, gussets, neckband, finishes)
	Drawing/s completed (yes/no)
	Photographs taken (yes/no)
7	Interpretation
	Deductions as to the technique/s used to make the fabric with appropriate evidence, as follows:
	Hand/machine/indeterminate
	Round
	Back and forth (turned/unturned)
	Working direction (with evidence from cast on, cast off, increases, decreases)
	Fleece characteristics: modern fine fleece is usually interpreted as less than 20.6 μm, medium from 22 to 29.3 μm, coarse from 31 to 34.4 μm and very coarse more than 36 μm
8	Further information
	Object description (in official record): take photocopy, photograph or pdf, if possible
	Comparable items (locations and accession numbers)
	Relevant literature (full references)
9	Examination record
	Name of examiner (first name & surname, affiliation with contact details)
	Place of examination
	Date of report

months. There were 339 visitors to the database of whom 91 were *lurkers* (people who check in regularly but do not interact online with the material). A hard core of 10 *engagers* took the time to examine caps in detail and comment on them [26-27].

The second largest group of KEME Team volunteers (20 per cent) identified themselves as reenactors, who were interested in knitting reconstructions [27]. The database includes a feature called "Knit this cap" which quickly retrieves the most necessary information for reconstructing it – the gauge and yarn diameter.

The largest numbers of KEME Team volunteers are in the United States (48 per cent) and the United Kingdom (27 per cent), where imperial measurements are used more readily than metric measurements. The database offers a feature which allows users to toggle between these two systems, thereby making the material more accessible and comprehensible [27].

The draft protocol has also been applied to other early modern artefacts, including fragments, caps, stockings and mittens, most of which are previously unpublished. The reports provide comparable data across

all the evidence offering a previously impossible scientific overview of evidence for early modern knitting [28-33].

Conclusion

This paper serves to introduce the draft protocol (see Table 2) and encourage its use in cataloguing and the study of knitted items. The use of a conventional system will also facilitate the entry of further knitted artefacts into the online database at http://www.kemeresearch.com, which has gathered much of the evidence for early modern knitting into an easily accessible public collection (see Figure 5 for the website hosting the database).

Feedback on the protocol's application to more complex items, such as liturgical gloves and patterned garments, is welcomed. Further collaboration on how the protocol can be translated into other languages is also an ongoing part of the project.

KEME has generated the possibility for mute objects lying in the dark drawers of museum storage to generate new scholarship through the application of a protocol for scientific study.

Acknowledgements

Many thanks to Ruth Gilbert, who has collaborated on this project throughout, and to Susanne Lervad for guidance on good practice in terminology work. The project was made possible through an EU-funded Marie Sklodowska Curie Fellowship 2015 to 2017 (grant agreement number 656748).

ORCID

Jane Malcolm-Davies
https://orcid.org/0000-0001-7765-0712

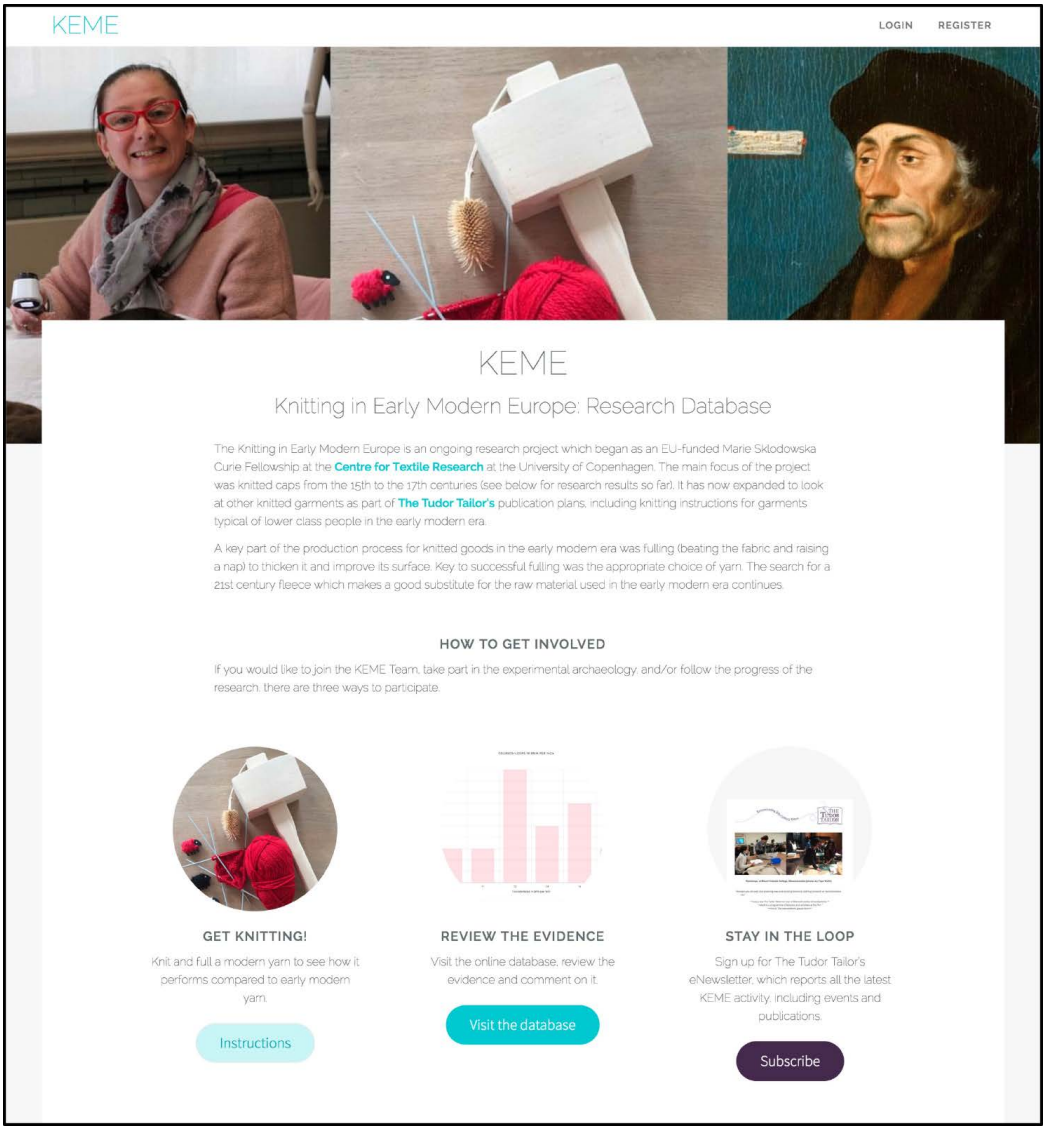


Figure 5. The home page for the Knitting in Early Modern Europe website and database at http://www.kemeresearch.com.

References

1 Orton-Johnson, K., 'Knit, purl and upload: new technologies, digital mediations and the experience of leisure', *Leisure Studies* **33**(3), (2014) 305-321, https://doi.org/10.1080/02614367.2012.723730.

2 Malcolm-Davies, J., 'Project homepage and database', in *Knitting in Early Modern Europe (KEME)*, https://kemeresearch.com/home (accessed 2018-7-27).

3 Malcolm-Davies, J.; Davidson, H., '"He is of no account ... if he have not a velvet or taffeta hat': a survey of 16th century knitted caps", in *Aspects of the Design, Production and Use of Textiles and Clothing from the Bronze Age to the Early Modern Era*, ed. K. Grömer & F. Pritchard, Archaeolingua, Budapest (2015) 223-232.

4 Kopytoff, I., 'The cultural biography of things: commoditisation as process', in *The Social Life of Things*, ed. A. Appadurai, University Press Cambridge, Cambridge (1986) 64-91, https://doi.org/10.1017/CBO9780511819582.004.

5 Botticello, J., 'The conservation of two Tudor knitted woollen flat caps', undergraduate thesis, Camberwell College, London (2003).

6 Haase, W.; Weißgraf, T., 'Ausblühungen an Gestricken des 17. Jahrhunderts aus einer Kloake in Lüneburg', in *Denkmalpflege in Lüneburg*, Lüneburger Stadtarchäologie, Lüneburg (2007) 75-79.

7 Rogers, P. W., 'Textiles', in *Under the Oracle. Excavations at the Oracle Shopping Centre Site 1996-8: The Medieval and Post-Medieval Urban Development of the Kennet Floodplain in Reading*, ed. B. Ford, D. Poore, R. Shaffrey & D. Wilkinson, Oxford Archaeology, Oxford (2013) 197-198.

8 Green, E., 'Is Tudor London trendy? Tudor textiles from London: cloth, clothing and status', undergraduate thesis, Bradford University, Bradford (2001).

9 Sagona, C., 'Two-needle knitting and cross-knit looping: Early Bronze Age pottery imprints from Anatolia and the Caucasus', *Oxford Journal of Archaeology* **37**(3) (2018) 283-297, https://doi.org/10.1111/ojoa.12141.

10 Hiatt, J. H., *The Principles of Knitting: Methods and Techniques of Hand Knitting*, Touchstone, New York (2012)

11 Stanley, M., *Knitter's Handbook: A Comprehensive Guide to the Principles and Techniques of Handknitting*, David & Charles, Newton Abbot (2001).

12 Rutt, R., *A History of Hand Knitting*, reprinted, Interweave Press, Loveland (1987).

13 Black, S., *Knitting: Fashion, Industry, Craft*, V&A Publishing, London (2012).

14 Buckland, K., 'The Monmouth cap', *Costume* **13** (1979) 23-37, https://doi.org/10.1179/cos.1979.13.1.23.

15 Ringgaard, M., 'The knitted sugar-loaf hat', in *Fashioning the Early Modern: Dress, Textiles and Innovation in Europe 1500-1800*, ed. E. Welch, Pasold Research Fund & Oxford University Press, Oxford (2017) 313-316.

16 *Vocabulary of Technical Terms: Fabrics*, Centre International d'Étude des Textiles Anciens, Lyon (2006).

17 Dury, P.; Lervad, S. 'Synonymic variation in the field of textile terminology', in *Textile Terminologies in the Ancient Near East and Mediterranean from the Third to the First Millenia*, ed. C. Michel. & M.-L. Nosch, Oxbow Books, Oxford (2016) 1-9.

18 *ISO 4921:2000 Knitting Basic Concepts and Vocabulary*, International Organization for Standardization, https://www.iso.org/obp/ui/#iso:std:iso:4921:ed-2:v1:en (accessed 2018-7-27)

19 *ISO 8388:1998 Knitted Fabrics*, International Organization for Standardization, https://www.iso.org/obp/ui/#iso:std:iso:8388:ed-1:v1:en (accessed 2018-7-27).

20 Emery, I., *The Primary Structure of Fabrics: An Illustrated Classification*, Thames & Hudson, London (1994).

21 Walton, P.; Eastwood, G., *A Brief Guide to the Cataloguing of Archaeological Textiles*, 4th ed., Textile Research Associates, York (1988).

22 Phipps, E., *Looking at Textiles: A Guide to Technical Terms*, J. Getty Trust Publications, Los Angeles (2011).

23 Thomas, M., *Mary Thomas's Book of Knitting Patterns*, Hodder & Stoughton, London (1943).

24 Gilbert, R., 'The king's vest and the seaman's gansey: continuity and diversity of construction in hand-knitted body garments in north western Europe since 1550', MPhil thesis, Textile Conservation Centre, University of Southampton, United Kingdom (2009).

25 Malcolm-Davies, J.; Gilbert, R.; Lervad, S., 'Unravelling the confusions: Defining concepts to record archaeological and historical evidence for knitting', *Archaeological Textiles Review* **60** (2018) 10-24.

26 Sun, N.; Pei-Luen, R.; Ma, L., 'Understanding lurkers in online communities', *Computers in Human Behavior* **38** (2014) 110-117, http://dx.doi.org/10.1016/j.chb.2014.05.022.

27 Malcolm-Davies, J., 'Knitting virtual tribes together: new audiences for cultural objects', in *Florence Heri-Tech – The Future of Heritage Science and Technologies*, ed. R. Furferi, R. Giorgi, L. Governi, M. Matteini & Y. Volpe, IOP Publishing (2018), https://doi.org/10.1088/1757-899X/364/1/012031.

28 Gilbert, R., 'Do you read my signal? An attempt at the application of clear terminology in recording archaeological knitwork', *Archaeological Textiles Review* **60** (2018) 25-33.

29 Ringgaard, M., 'The church cap and the crypt cap: Early Modern knitted fragments found in Denmark', *Archaeological Textiles Review* **60** (2018) 34-41.

30 O'Connell Edwards, L., 'Knitted wool stockings in the Museum of London: A study of 16th century construction', *Archaeological Textiles Review* **60** (2018) 42-51.

31 Odstrčilová, S., 'Early Modern stockings in museums in the Czech Republic', *Archaeological Textiles Review* **60** (2018) 51-63.

32 Lundin. H., 'Knitted fragments of clothes excavated from the Swedish 17th century flagship *Kronan*', *Archaeological Textiles Review* **60** (2018) 64-74.

33 Willemsen, A., 'Two knitted mittens from a 17th century Dutch shipwreck', *Archaeological Textiles Review* **60** (2018) 75-82.

Received: 2018-7-31
Revised: 2018-12-19
Accepted: 2019-1-15
Online: 2019-2-25

Estudos sobre têxteis históricos
Studies in historical textiles
A. Serrano, M. J. Ferreira, E. C. de Groot (ed.)

Note / Nota

GMS – Gammadiae Management System: cataloguing and interpretation project of the so-called *gammadiae* starting from the iconographic evidences in the Roman catacombs

Cristina Cumbo[1,*]
Fabio Cumbo[2]

[1] *Pontificio Istituto di Archeologia Cristiana, Holy See*
[2] *Institute for Systems Analysis and Computer Science "Antonio Ruberti", National Research Council of Italy, Rome, Italy; Department of Engineering, University of Roma Tre, Rome, Italy*
**criscumbo@gmail.com*

Abstract
In the Early Christian catacombs of Rome, the use of the so-called *gammadiae* was pretty common. Unfortunately, at the daily state of the art, the comprehension of these symbols is still object of discussion for the international research community. In this paper we present the Gammadiae Management System (GMS), a database developed to study and comprehend the meaning of the so-called *gammadiae* represented on the *pallium* of saint characters in Early Christian catacombs of Rome. The cataloguing process has been useful to understand a particular symbolism used in the Antiquity, since the 1st century A.D. in the Jewish textile evidences, till the Dura Europos synagogue frescoes and, also, in some profane evidences, such as mosaics or precious gems. The so-called *gammadiae* seem to indicate the authority and the moral qualities of the men and, rarely, women who wear the *pallium*. At the moment, the GMS contains 209 forms about the so-called *gammadiae* in the Roman catacombs, realised in various techniques and on different supports.

Keywords
Gammadiae
Clothing
Early Christian Archaeology
Catacombs
Database
Symbolism

GMS – Gammadiae Management System: projecto de catalogação e interpretação dos chamados *gammadiae* a partir das evidências iconográficas nas catacumbas romanas

Resumo
O uso das *gammadiae* era bastante comum nas catacumbas paleocristãs em Roma. Infelizmente, de acordo com o estado da arte atual, a compreensão destes símbolos ainda é objeto de discussão entre a comunidade internacional. Este artigo apresenta o Sistema de Gestão *Gammadiae* (GMS), uma base de dados desenvolvida com vista ao estudo e compreensão do significado das *gammadiae* apresentadas no *pallium* de catacumbas romanas de santos paleocristãos. O sistema de catalogação revelou-se útil para entender o simbolismo específico usado na Antiguidade, desde o século I d. C., em testemunhos têxteis judeus, em frescos da sinagoga Dura Europos e ainda em testemunhos profanos, nomeadamente mosaicos ou pedras preciosas. As *gammadiae* parecem evidenciar autoridade e costumes morais nos homens, e raramente em mulheres, que usavam o *pallium*. Neste momento, o GMS possui 209 entradas acerca das *gammadiae* em catacumbas romanas, realizadas através de várias técnicas e em diferentes suportes.

Palavras-chave
Gammadiae
Vestuário
Arqueologia Paleocristã
Catacumbas
Base de dados
Simbolismo

ISSN 2182-9942

The so-called *gammadiae* and their interpretative problem

The study of the so-called *gammadiae* has always presented numerous troubles [1]. The discovery of their symbolic meaning and origin has involved many scholars [2] who tried solving questions starting from their personal observations over the course of centuries.

These symbols were improperly called *gammadiae* because of a strong similarity with the Greek letter Γ [3-4], according to the common opinion of the research community; furthermore, they were represented on the hem of the *pallium* worn by Christ, saints and apostles as depicted in Early Christianity (Figure 1) [5]. Indeed, the *gammadiae* – term that, from now, will be conventionally used in this paper – have never been object of a systematic analysis to finally catalogue them and understand their meaning.

Nevertheless these symbols – which changed their shape by the end of the 4th century A.D. becoming real letters, totally different from the square frames which are typical of curtains or table clothes – seem to be important *iconographic appendages* that distinguish the saint characters in particular. Usually ignored in the academic descriptions or superficially mentioned, they were waiting for a deeper study why them emerged since the first appearance on textile in the 1st century A.D. textiles (but this is a research in progress), then on the Jewish frescoes of the Dura Europos synagogue, on the profane evidences and on the more known Early Christian ones.

During the last years, Luca Avellis [6] and Maciej Szymaszek [7-8] proposed relevant insights that bring back the attention on this little known iconographic argument, without forgetting the famous Antonio Quacquarelli's iconological-patristic digression [9-22]. In his recent work, Maciej Szymaszek [23-24] focused his reflections on statistical data taken from iconographic and chemical textile analysis, stating that the *gammadiae* didn't belong to a particular religious meaning and, at the same time, they were present in various artistic evidences spread in the entire ancient world.

Instead, the textile evidences are only a part – although very substantial – of the large universe that involved the *gammadiae*. With no doubt, before the coming of the modern archaeological excavations and the consequent findings, scholars founded their theories on the direct or indirect observations of the frescoes and the basilical mosaics. While first ones were located in the catacombs and a limited number of scholars obtained access to the ancient Christian cemeteries, the second ones were, instead, more reachable because of their location in freely accessible monuments.

The study of the *gammadiae*, based exclusively on the pictures published in the Antonio Bosio's *Roma Sotterranea* [25], has essentially led to inaccuracies and real morpho-

Figure 1. Rome. Catacomb of St. Callixtus, Cubiculum of sheep. Zoom on the *gammadia* on the St. Peter's *pallium* [5, tab. 237,2].

logical mistakes, which have influenced ideas and suppositions about the intrinsic meaning of these symbols during some centuries. The absolute trust in the Maltese scholar's tome, without having carried out checks about the illustrated reliability of the catacomb frescoes, caused the wrong interpretation of some symbols which were seen as merely inexistent letters [2]. This is the case with the *gammadia* X, result of the confusion originated by the partial deterioration of the appendages of a swastika; this is also the case of the *gammadia* T, resulted by the confused interpretation of the *gammadia* ⌶ whose base was deteriorated or differently traced [24, p. 656-657] (Figure 2) [25].

Until the accurate Joseph Wilpert's watercolours [5] and the Antonio Quacquarelli's [9-22] brave studying attempt, who interpreted the *gammadiae* in a more patristic and numerological way than really iconographic, it wasn't possible to define a detailed and complete view of this symbols represented in the Early Christian catacombs.

Gammadiae Management System: a database to catalogue the so-called *gammadiae*

The advent of technology, computers and photographic cataloguing systems made all this possible.

The GMS was born as an auxiliary instrument for the Ph.D. research "Le *gammadiae* nelle catacombe romane: censimento ed ipotesi interpretative" (The *gammadiae* in the Roman catacombs: census and interpretative hypothesis) [26], in which the author focused her attention on the specific analysis of the ancient Roman cemeteries. Thanks to the availability of the Pontifical Commission for Sacred Archaeology, it was possible to inspect catacombs and consult its historical and modern photographic archive. The presence of different *gammadiae* in some cemeterial frescoes has been reported to redact a complete catalogue.

Considering that the *gammadiae* were not yet studied in a systematic way, the need has emerged to create a database, providing a tool to catalogue them. Currently the database is accessible under request to the corresponding author only at the following address: http://gammadiae.000webhostapp.com.

The GMS has been entirely developed in PHP and uses the framework Bootstrap for the graphic interface, to guarantee a better user experience depending on the used device (desktop, smartphone, tablet). It is able to collect the complete file, with the expansion possibility and data modification, so that, through this tool, the various information derived from it can be processed.

Every *gammadia* is represented by a form containing the following information fields (Figures 3-5):

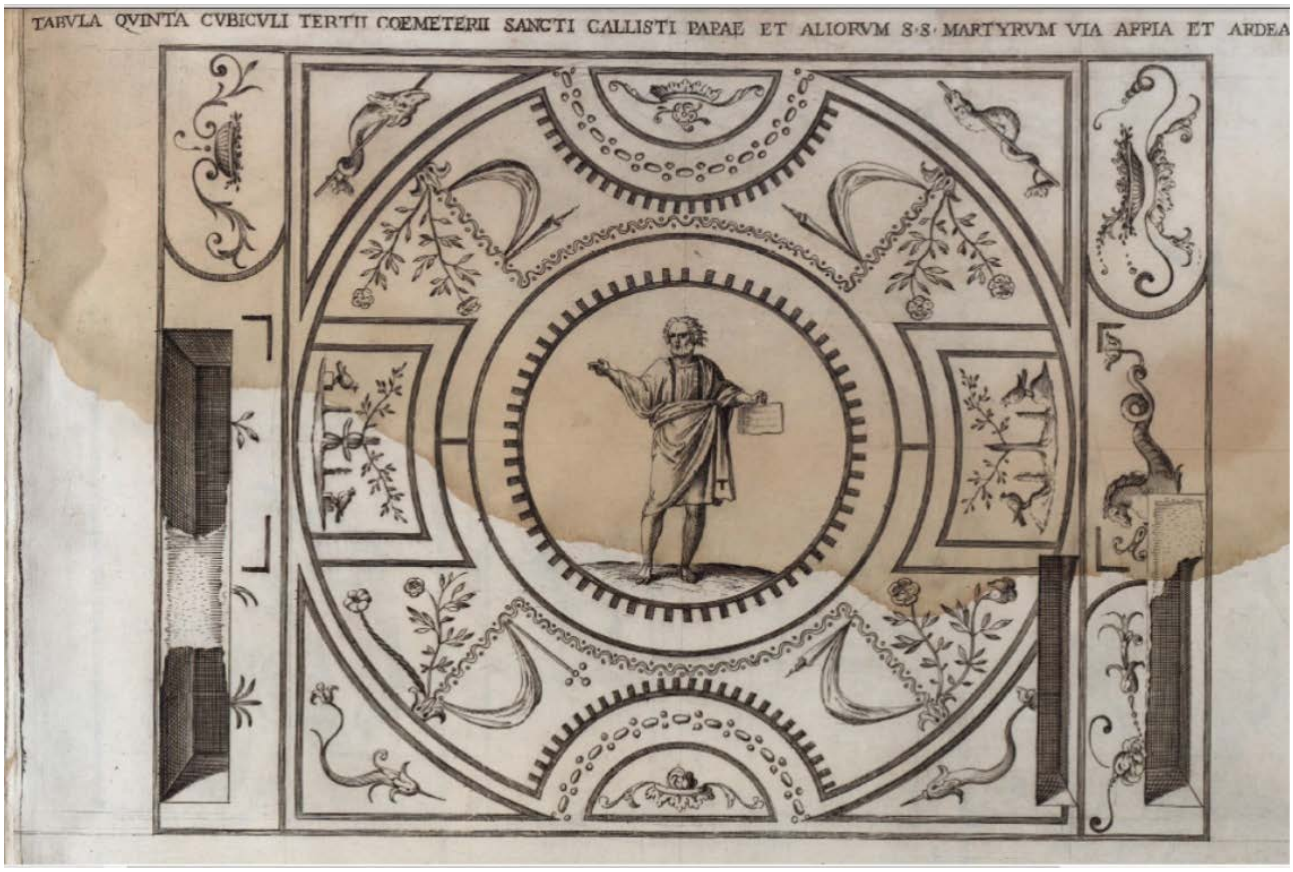


Figure 2. Rome. Catacomb of Domitilla, Cubiculum of David [24, p. 247].

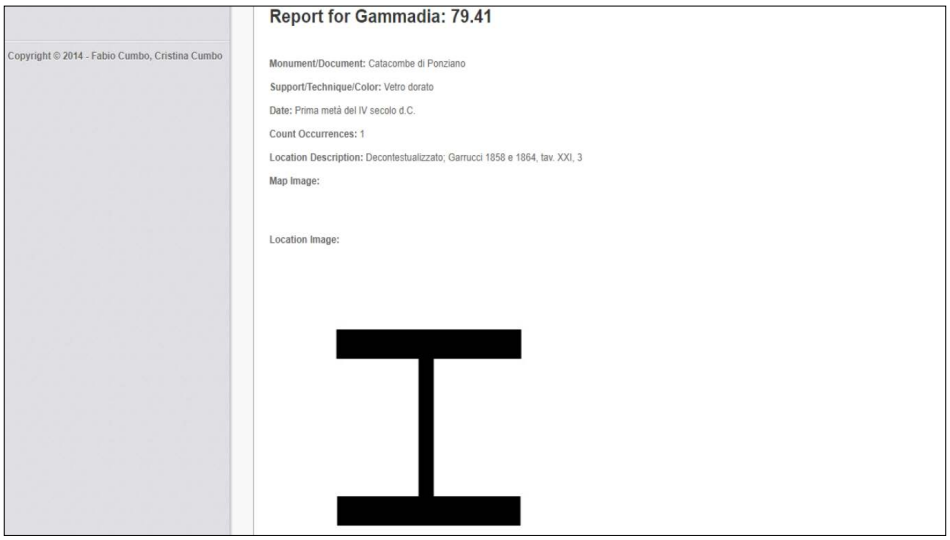


Figure 3. Form example from database GMS. Sections: monument/document; support/technique/color; date; count occurrences; location description; map image; location image.

Figure 4. Form example from database GMS. Sections: character; scene; scene context; description; comments; restoration and conservation; consulted bibliographies; photo of a particular.

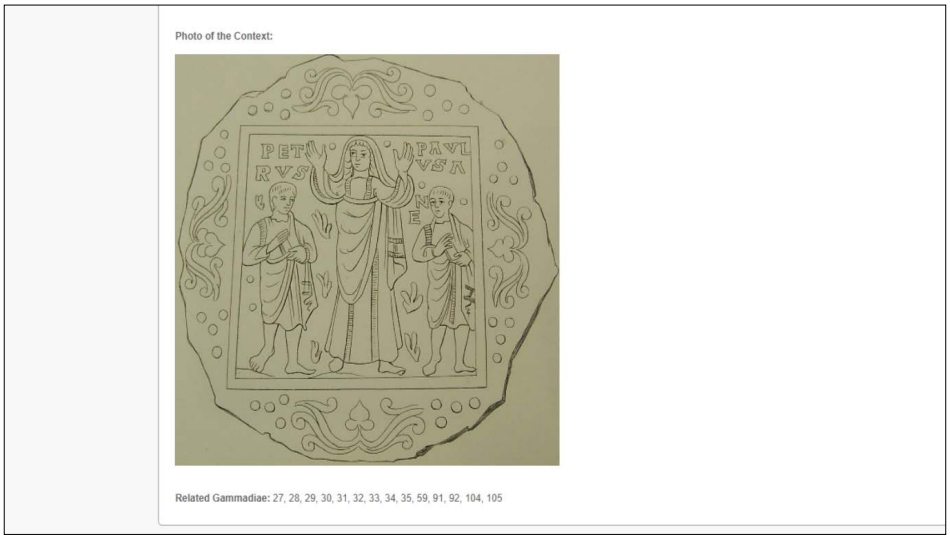


Figure 5. Form example from database GMS. Sections: photo of context; related *gammadiae*.

- **Numeration:** this field represents the catalogue number (it is worth noting that it is unique because it represents a specific *gammadia*) provided with a dot from the progressive form number;
- **Monument/document:** this represents a cemetery/ monument/ document on which or in which the *gammadia* is reported. This field is functional to the type of object/ place will be investigated (cemeteries, archaeological sites, manuscripts, engraved burial stones, gold glasses, textiles, etc.);
- **Support/technique/color:** this field contains information about the technique used to create the *gammadia* (fresco, mosaic, stucco, etc.) and its color, because of the chromatic variation depending on the investigated monument/document;
- **Date:** specifying the century or the precise year of the monument/document;
- **Count occurrences:** specifying the number of visible *gammadiae* on the analyzed character's garment;
- **Location description:** indicating the specific position of the fresco in the cemetery (cubicles, arcosolia, loculi, etc.), or the find conservation site. In this same field, the references to pictorial or photographic repertories are included;
- **Map:** if available, the map (of a catacomb or other archaeological sites) is inserted in this field. On the map, the specific location of the analyzed *gammadia* must be indicated;
- **Location image:** in this field the image of the general catalogue edited on

the morphologic changes that the *gammadia* suffered during the centuries will be inserted;
- **Character:** this field represents the character that wears the garment with the *gammadia*. It is required in the case of figurative scenes and could be empty in the case of other materials (i.e.: textile fragments);
- **Scene:** specifying the scene in which the analyzed character is present;
- **Context:** this field is dedicated to the complete description of the scene with references to the Old and New Testament passages, in case it is dealing with a Christian episode, or other narrative features found in different representations (profane or Jewish ones). It contains the description of the archaeological context in the case of textile fragments with *gammadiae*;
- **Description:** including the morphological description of the *gammadia*;
- **Comments:** reporting the eventual scholars' opinions and manually curated comments about the analyzed *gammadia*;
- **Restorations and conservation:** this field is dedicated to the recovery operations and/or the degradation status of the monument/document;
- **Consulted bibliography:** the field will be completed with the principal bibliographic references;
- **Photo of a particular:** this image concerns the details of the *gammadia*;
- **Photo of the context:** this image concerns, instead, the whole scene;
- **Related *gammadiae*:** this field includes a list of related *gammadiae*. They could be directly linked to each other because founded on the same monument/site/find. This is the case of catacomb frescoes representing scenes in which one or more *gammadiae* are depicted.

In order to select useful information and obtain statistical data, the GMS provides a simple but efficient feature to filter out the *gammadiae* with common characteristics (Figure 6):
- Numeration
- Monument/document
- Support/technique/color
- Date
- Count occurrences
- Character
- Scene

This feature could be expanded in the future, implementing automatic search and cataloguing tools that exploit advanced Machine Learning and Computer Vision techniques.

It is worth noting that the values of these 7 out of 18 features are at most key words and numbers making the search operation extremely easy. Conversely, the other 11 features could contain free text. This is essentially the main reason why they were not considered. However, these fields could contribute to extract significant insights, so the search feature will be for sure improved in future.

Roman catacombs are, in fact, only one of the various and numerous realities in which the presence of these particular symbols is documented. The double meaning of some of the previously described entries has been inserted for this reason, so that the GMS can be used to catalogue also frescoes related to other Christian cemeteries, Jewish and profane archaeological sites, or finds as intact or fragmentary textiles, portrait sarcophagi, monumental mosaics, gold glasses, engraved burial stones and gems [27].

The final aim of the GMS project is to become a national and international study tool, to ensure that these symbols do not remain something still *mysterious*, providing the possibility to study and understand them and widely spread their meaning to the international scientific community.

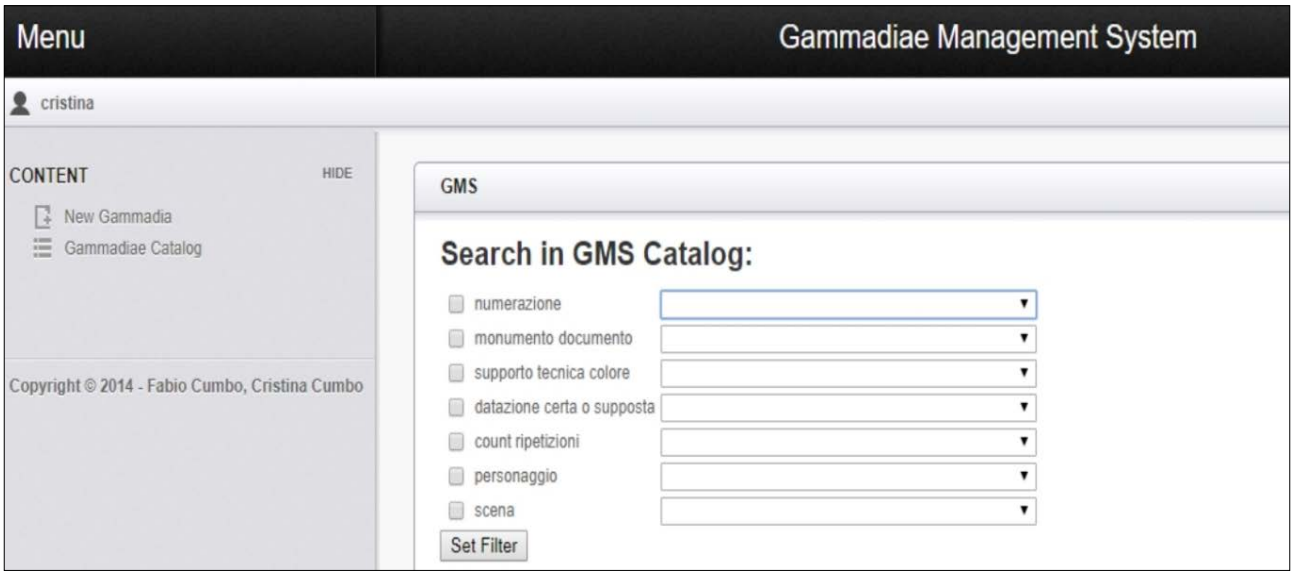


Figure 6. Filter form from database GMS.

For what concerns the Roman catacombs, with the addition of two devotional monuments, such as the so-called Christian Chapel under the St John's Hospital [28-32] and the Pammachio's Oratory under the basilica of the Saints Giovanni and Paolo [33-34], the results were satisfactory to understanding the use of the *gammadiae* in the Early Christian iconographic sector between the second half of the 3rd century A.D. and the end of the 4th-beginnings of the 5th century A.D., with some offshoots related to the 6th-7th centuries A.D. few catacomb frescoes.

The 212 *gammadiae* realized with fresco technique correspond to 184 forms, while the 26 *gammadiae* in golden sheet correspond to 21 forms, although the gold glasses examined are 12.

In fact, sometimes a single character wears a garment with two *gammadiae* not completely identical from a morphological point of view, for which several separate forms have been created.

For what concerns the only one *gammadia* realized in mosaic [35, p. 462; 36-38] there is one correspondence, so one form; the 4 *gammadiae* engraved on burial stones correspond to 3 forms related to 3 engraved burial stones from the *Maius* Cemetery, the catacombs of Giordani and the catacombs of Commodilla [39, vol. 8, 21730a; 40-41; 42, fig. 447, p. 944; 43].

Finally 209 forms were completed in GMS, but the total number of single *gammadiae* is 243.

In order to be able to identify every single evidence, all frescoes of the Early Christian catacombs of Rome and of the hypogea under the protection of the Pontifical Commission for Sacred Archaeology were examined, as well as other monuments, logically not included in the analysis for the lack of evidences useful for the investigation.

The analysed *gammadiae* were identified in the following Early Christian cemeteries, which will be listed following the itinerary called *Notitia Ecclesiarium* [44, p. 67-99]:

Figure 7. Rome. Catacomb of Ciriaca, Arcosolium of Zosimiana [5, tab. 205].

Figure 8. Synagogue of Dura Europos, Moses saved from the river [52, fig. 178].

- Catacombs of St. Ermete;
- Catacombs of Giordani;
- Anonymous catacombs of via Anapo;
- Catacombs of Priscilla;
- *Maius* Cemetery;
- Catacombs of Ciriaca;
- Catacombs of Novaziano [45, p. 221; 46; 47, n. 51, p. 13];
- Catacombs of St. Marcellinus and St. Peter;
- Anonymous hypogeum of via Dino Compagni;
- Catacombs of St. Sebastian;
- Catacombs of ex vigna Chiaraviglio;
- Catacombs of Pretestato;
- Catacombs of St. Callixtus;
- Catacombs of Saints Marc, Marcelliano and Damasus;
- Catacombs of Domitilla;
- Catacombs of Commodilla;
- Catacombs of St. Tecla;
- Catacombs of Generosa;
- Catacombs of Ponziano.

The statistical analysis, from which a morphological reflection was derived, highlighted an important result: the most widespread *gammadia* among all the known symbols is certainly the ⊥ (corresponding to No. 79 of the reference catalogue [25]) which, during its permanence in Roman cemetery painting, assumed a different morphological meaning depending on the skill of the performing artist or the inclination due to the verse of the *pallium* on which it was represented (Figure 7) [5]. It is possible to make this deduction exclusively from the complete observation of every existing evidence and the related comparisons. This same *gammadia*, for example, will be represented inclined, remembering the letter Z – facing left or right – especially in the two cemeteries of Domitilla [48] and Via Anapo [49].

Sometimes, the *gammadia* ⊥ is more similar to the letter I, because the artist usually produced his work with a thinner stroke – without considering the proportion of the letter itself with the style of the involved fresco and with the shortest apices.

Sometimes, it seems that the painters interpreted the *gammadiae* not as simple symbols, but as letters, perhaps to make them more comprehensible. In the 4th century A.D. we have, for example, only two samples of angular *gammadiae*, that take the shape of the letter L in the same cubicle [50, p. 69; 51, p. 99] of the hypogeum of via Dino Compagni, but this is not surprising.

In fact, it will be extremely relevant to make a comparison between the Christian evidences and, specifically, the Jewish ones, considering the various textile evidences and the frescoes of Dura Europos [52, vol. 9, p. 124-174; 53].

It seems that those symbols with *toothed ends*, represented either vertically or horizontally, either represented as a strip or an angle, and thus marked in the 1st-3rd centuries A.D., have arrived within the iconography and Christian symbolism towards the second half of the 3rd century A.D., remaining and taking root in the Christian religion.

These same symbols, which can not be assimilated to letters, always seem to hold the same function both in Jewish antiquity and in the profane ages [27; 54, n. 79, p. 172; 54, p. 221; 55-56], until the Christian era: highlighting the moral importance, the authority, the rightness or the sanctity of the individual characters wearing the *pallium* marked by the *gammadiae*. In the past, Goodenough [52, vol. 12, pp. 164-165] had already guessed that the symbols represented in the Dura Europos synagogue could have been inserted in order to highlight a symbolic force intrinsic to specific characters, dressed in the Greek manner, but further comparisons needed to verify such a hypothesis.

Additionally, in the Christian sector, another peculiarity seems to be inserted. It concerns the rotating swastika towards the left, probably following a functional process that highlights the Christological symbolism and, in some cases, the vision of Christ as *Sol Iustitiae*.

Thus, the GMS can be defined as a data driven tool to extract significant insight. Also, in the case of Christianity: no simple deceased man or woman wears garment marked by any *gammadia*; contrarily, the holy characters (i.e.: Christ, the apostles, the martyrs, following in some way the Jewish trail analyzed to Dura Europos, in which only the righteous, the patriarchs and their retinue, the mother and sister of Moses), wear clothes marked by the *gammadiae* (Figure 8) [52].

In Christianity, essentially all men wear the *pallium* with the *gammadiae*, with the exception of St. Agnes, represented on the gold glass from the catacombs of Novaziano [45-47]. This is an extremely interesting evidence. It means that St. Agnes deserves to be elevated to the level of all the other martyrs, saints and apostles for her purity and morality.

Furthermore, from a topographical point of view, the GMS revealed that a great number of frescoes with the *gammadiae* are mainly concentrated in some specific areas of the catacombs.

In particular, this is evident in the catacombs of Domitilla and the St. Marcellinus and St. Peter [57], suggesting that the people buried in these places could have the same origins, or it could follow a specific cultural flow according to which the *gammadiae* were used as symbols. In fact, not all the frescoes, although representing the same scenes, are affected by these symbols, which presupposes a weighted and not mechanical choice by the costumers and not by the painters [58].

Therefore, it is important to highlight this phenomenon in relation to the totality of the frescoes in the catacombs: despite the fair number of evidences with the *gammadiae*, few of them presents these symbols. A strong concentration is also recorded in the anonymous hypogeum of via Dino Compagni [50-51] in which profane members were supposedly buried, but also Christians with probably Jewish roots.

The use of the GMS has therefore allowed carrying out a hard research, without which, presumably, no equally interesting insights would have been obtained. The way to eventually understand the *gammadiae* is still long, unless a fortunate discovery will finally reveal their meaning and origin.

However, it is still possible to follow the most tortuous and long *road*, but perhaps even more satisfying to reconstruct the symbolic puzzle: the cataloguing of all the pictorial, mosaic, sculptural, textile, etc. evidences marked by the *gammadiae*. Only in this way we will be able to perform a chronological and topographical analysis, until we will reach a final reconstruction of that movement of the people that led to a certain cultural diffusion.

The GMS project – which actually needs funding to continue the international cataloguing – could be the first data driven tool to be used in collaboration with international museums and research organizations to try to reconstruct another piece of our complex history.

Acknowledgements

This paper is taken from Cristina Cumbo's lecture, presented on 19th November 2015 at the École Française de Rome during an ITAR seminar. The author thanks Norbert Zimmermann for inviting her to present the project and the respective studies which, at that time, were still being completed.

ORCID

Fabio Cumbo
https://orcid.org/0000-0003-2920-5838

References

1 Cumbo, C., 'GMS: *Gammadiae* Management System. Progetto di catalogazione e interpretazione delle *gammadiae* a partire dalle testimonianze iconografiche nel sottosuolo romano', *communication given at ITAR seminar*, École Française de Rome (2015).

2 Cumbo, C., 'La questione delle *gammadiae*: rassegna degli studi', *Augustinianum* **57** (2) (2017) 515-539, https://doi.org/10.5840/agstm201757228.

3 Mazzoleni, D., '*Gammadia*', in *Temi di Iconografia Paleocristiana*, ed. F. Bisconti, Pontificio Istituto di Archeologia Cristiana, Città del Vaticano (2000) 185-186.

4 Ghilardi M., '*Gammadie*', in *Nuovo Dizionario Patristico e di Antichità Cristiane*, ed. A. Di Berardino, Marietti, Roma (2006-2007) 2054-2056.

5 Wilpert, J., *Le Pitture Delle Catacombe Romane*, Desclee Lefebvre & C., Roma (1903).

6 Avellis, L., 'Le *gammadiae*', *Vetera Christianorum* **47** (2010) 221-248.

7 Szymaszek, M., 'Termin "gammadia" w "Liber Pontificalis"', *U Schyłku Starożytności* **12** (2013) 119-147.

8 Szymaszek, M., 'L'origine delle cosidette gammadiae nell'arte cristiana antica', in *Atti del XVI Congresso Internazionale di Archeologia Cristiana (Roma 22-28 settembre 2013)*, Pontificio Istituto di Archeologia Cristiana, Città del Vaticano (2016) 2415-2425.

9 Quacquarelli, A., 'Ai margini dell'*actio*: la *loquela digitorum*', *Vetera Christianorum* **7** (1970) 199-224.

10 Quacquarelli, A., *L'Ogdoade Patristica e Suoi Riflessi Nella Liturgia e Nei Monumenti*, Bari,: Adriatica (1973).

11 Quacquarelli, A., 'Note sulle piante degli edifici di culto negli ideali dei Padri', in *Atti del III Congresso Nazionale di Archeologia Cristiana (Antichità Altoadriatiche VI)*, Edizioni Università di Trieste, Trieste (1974) 1-16.

12 Quacquarelli, A., 'Note sugli ideali patristici delle piante di edifici di culto', in *Forma Futuri. Studi in onore del Cardinale Michele Pellegrino*, Torino (1975) 1125-1137.

13 Quacquarelli, A., 'Le gammatiche del battistero degli Ariani di Ravenna', *Corsi di Cultura sull'Arte Ravennate e Bizantina* **24** (1977) 293-301.

14 Quacquarelli, A., 'La simbologia delle lettere cristologiche nel battistero degli Ariani di Ravenna', *Romanobarbarica* **2** (1977) 232-246.

15 Quacquarelli, A., 'Il monogramma cristologico (gammadia) Z', *Vetera Christianorum* **15** (1978) 5-31.

16 Quacquarelli, A., 'Il monogramma cristologico (Gammadia) H', *Vetera Christianorum* **16** (1979) 5-26.

17 Quacquarelli, A., 'I monogrammi cristologici del battistero degli ortodossi di Ravenna', *Corsi di Cultura Ravennate e Bizantina* **26** (1979) 313-324.

18 Quacquarelli, A., 'Catechesi liturgica e iconologica alla Trinità nei primi secoli. Gammadia (lettera cristologica) Γ', *Vetera Christianorum* **18** (1981) 5-32.

19 Quacquarelli, A., 'La cristologia di Boezio', *Bessarione* **2** (1981) 5-44.

20 Quacquarelli, A., 'La gammadia pietra angolare L', *Vetera Christianorum* **21** (1984) 5-26.

21 Quacquarelli, A., 'La lettera cristologica (gammadia) I nella iconografia dei primi secoli', *Vetera Christianorum* **23** (1986) 5-19.

22 Quacquarelli, A., 'Lettere e segni nella iconografia cristiana antica dei secoli III e IV', *Vetera Christianorum* **32** (1995) 255-268.

23 Szymaszek, M., 'The distribution of textiles with "Greek letter" signs in the Roman World: the case of the so-called gammadia', in *Textile Trade and Distribution in Antiquity/ Textilhandel und-distribution in der Antike*, ed. Kerstin Droß-Krüpe, Harrassowitz Verlag, Wiesbaden (2014) 189-197.

24 Szymaszek, M., 'On the interpretation of textile finds with right-angled or H-shaped tapestry bands', in *Textiles, Tools and Techniques of the 1St Millennium AD from Egypt and Neighbouring Countries*, ed. A. De Moor, C. Fluck & P. Linscheid, Lanoo Publishers, Tielt (2015) 168-175.

25 Bosio, A., *Roma Sotterranea*, Edizioni Quasar, Roma (1998).

26 Cumbo, C., 'Le *gammadiae* nelle catacombe romane: censimento ed ipotesi interpretative', Ph.D. dissertation, Pontificio Istituto di Archeologia Cristiana, Roma (2016).

27 Cumbo, C., 'Attori e *gammadiae*: da un diaspro rosso della Collezione Medicea di Firenze ai mosaici profani con raffigurazioni teatrali', in *Atti del convegno "Arti minori e arti maggiori. Relazioni e interazioni tra Tarda Antichità e Alto Medioevo"*, *Catania-Siracusa 12-14 maggio 2016*, ed. F. Bisconti, M. Braconi & M. Sgarlata, T. Sardella (forthcoming).

28 Santa Maria Scrinari, V., 'Documenti paleocristiani nell'ambito dello storico ospedale di S. Giovanni al Laterano', *Rendiconti della Pontificia Accademia Romana di Archeologia* **48** (1975-1976) 377-391.

29 Santa Maria Scrinari, V., 'Aggiornamento sulla topografia lateranense', in *Atti del IX Congresso Internazionale di Archeologia Cristiana (Roma 21-27 settembre 1975)*, vol. 2, Pontificio Istituto di Archeologia Cristiana, Città del Vaticano (1978) 470-482.

30 Santa Maria Scrinari, V., 'Contributo all'urbanistica Tardo Antica sul Campo Laterano', in *Atti dell'XI Congresso Internazionale di Archeologia Cristiana (Lione, Vienna, Grenoble, Ginevra, Aosta 21-28 settembre 1986)*, vol. 3, Pontificio Istituto di Archeologia Cristiana, Città del Vaticano (1989) 2201-2220.

31 Santa Maria Scrinari, V., 'Le cappelle paleocristiane', in *Il Laterano Imperiale*, vol. 2, Pontificio Istituto di Archeologia Cristiana, Città del Vaticano (1995) 215-241.

32 Cerrito, A., 'Oratori ed edifici di culto minori di Roma tra il IV secolo e i primi decenni del V', in *Ecclesiae Urbis. Atti del Congresso Internazionale di Studi Sulle Chiese di Roma (IV-X secolo), Roma 4-10 settembre 2000*, ed. F. Guidobaldi & A. G. Guidobaldi, Pontificio Istituto di Archeologia Cristiana, Città del Vaticano (2002) 397-418.

33 Wilpert, J., 'Le pitture della "*confessio*" sotto la Basilica dei SS. Giovanni e Paolo', in *Scritti in Onore di Bartolomeo Nogara Raccolti in Occasione del suo LXX Anno*, Pontificio Istituto di Archeologia Cristiana, Città del Vaticano (1937) 517-522.

34 Vlad Borrelli, L., 'Il restauro delle pitture nel sottosuolo della chiesa dei SS. Giovanni e Paolo', *Bollettino ICR* **25-26** (1956) 58-71.

35 Marangoni, G., *Delle Cose Gentilesche, e Profane Transportate AD Uso e Adornamento Delle Chiese*, Roma (1744).

36 Ferrua, A., '*Qui Filius diceris et Pater inveniris*. Mosaico novellamente scoperto nella catacomba di S. Domitilla', *Rendiconti della Pontificia Accademia Romana di Archeologia* **33** (1960-1961) 209-224.

37 Bisconti, F., 'L'arcosolio mosaicato nelle catacombe di Domitilla: lineamenti iconografici', in *Atti dell'VIII Colloquio dell'Associazione Italiana per lo Studio e la Conservazione del Mosaico (Firenze, 21-23 febbraio 2001)*, Edizioni del Girasole, Ravenna (2001) 517-528.

38 Pogliani, P., 'Il mosaico con la *Maiestas Domini*, la resurrezione di Lazzaro e i tre fanciulli ebrei nella fornace della catacomba di Domitilla', in *L'Orizzonte Tardoantico e le Nuove Immagini. 312-468*, vol. 1, ed. M. Andaloro, Palombi Editori, Milano (2006) 175-178.

39 *Inscriptiones Christianae urbis Romae septimo saeculo antiquiores. Nova series*, Ex Officina Libraria Doct. Befani, Roma.

40 Testini, P., 'La lapide di Anagni con la "*Traditio Legis*". Nota sull'origine del tema', *Archeologia Classica* **25-26** (1973-1974) 718-740.

41 Cascianelli, D., 'Pasquale Testini e la "*Traditio Legis*" di Anagni. Una copia del mosaico absidale dell'antica basilica di S. Pietro in Vaticano in una lapide romana', in *Atti del Convegno di Studi "Incisioni Figurate della Tarda Antichità", Roma, Palazzo Massimo 22-23 marzo 2012*, ed. F. Bisconti & M. Braconi, Pontificio Istituto di Archeologia Cristiana, Città del Vaticano (2013) 623-646.

42 Wilpert, J., *Die Römischen Mosaiken und Malereien der kirchlichen Bauten vom IV. bis XIII. Jahrhundert*, Freiburg im Breisgau (1916).

43 Pergola, A., 'Scena agiografica dalla catacomba di Commodilla. Lastra incisa con i martiri Felice e Adautto', in *Atti del Convegno di Studi "Incisioni Figurate della Tarda Antichità", Roma, Palazzo Massimo, 22-23 Marzo 2012*, ed. F. Bisconti & M. Braconi, Pontificio Istituto di Archeologia Cristiana, Città del Vaticano (2013) 579-600.

44 Valentini, R., Zucchetti, G., *Codice Topografico della Città di Roma*, vol. 3, Roma (1946).

45 Fornari, F., 'Relazione circa una nuova regione cimiteriale a S. Lorenzo', *Rivista di Archeologia Cristiana* **6** (1929) 179-239.

46 Morey, C. R., *The Gold-glass Collection of the Vatican Library: with Additional Catalogues of Other Gold-glass Collections*, Pontificio Istituto di Archeologia Cristiana, Città del Vaticano (1959).

47 Josi, E., 'Cimitero alla sinistra della via Tiburtina al viale Regina Margherita (continuazione)', *Rivista di Archeologia Cristiana* **11** (1934) 206-207.

48 Bisconti, F. (ed.), *Catacombe di Domitilla: Restauri Nel Tempo*, Pontificio Istituto di Archeologia Cristiana, Città del Vaticano (2017).

49 Deckers, J. G., Mietke, G., Weiland, A., Fiocchi Nicolai, V., *Die Katakombe "Anonima di via Anapo": Repertorium der Malereien*, Pontificio Istituto di Archeologia Cristiana, Città del Vaticano (1991).

50 Ferrua, A., *Le Pitture della Nuova Catacomba di Via Latina*, Pontificio Istituto di Archeologia Cristiana, Città del Vaticano (1960).

51 Ferrua, A., *Catacombe Sconosciute: una Pinacoteca del IV Secolo Sotto la Via Latina*, Nardini, Firenze (1990).

52 Goodenough, E. R., *Jewish Symbols in the Greco-Roman Period*, vol. 1-13, Pantheon, New York (1953-1968).

53 Kraeling, C. H., *The Excavations at Dura-Europos Conducted by Yale University and the French Academy of Inscriptions and Letters. Final Report 8:1. The synagogue*, Oxford University Press, London (1956).

54 Tondo, L., Vanni, F. M., *Le gemme dei Medici e dei Lorena nel Museo Archeologico Nazionale di Firenze, Firenze 1990*, Arezzo (1990).

55 Charitonidis, S., Kahil, L., Ginouvès, R., *Les Mosaïques de la Maison du Ménandre a Mytilène*, Francke Verlag, Bern (1970)

56 Zimmermann, N., Ladstätter, S., *Wall Painting in Ephesos from the Hellenistic to the Byzantine Period*, Ege Yayinlari, Istanbul (2011).

57 Deckers, J. G., Seeliger, H. R., Mietke, G., *Die Katakombe "Santi Marcellino e Pietro": Repertorium der Malereien*, Pontificio Istituto di Archeologia Cristiana, Città del Vaticano-Münster (1987).

58 Zimmermann, N., *Werkstattgruppen Römischer Katakombenmalerei*, Aschendorff Verlag, Münster (2002).

Received: 2018-4-23
Revised: 2018-10-25
Accepted: 2018-11-21
Online: 2019-1-15

Estudos sobre têxteis históricos
Studies in historical textiles
A. Serrano, M. J. Ferreira, E. C. de Groot (ed.)

Nota / Note

Tesouros têxteis do cofre relicário da Princesa Santa Joana

Maria João Mota

Museu de Aveiro, Av. Santa Joana Princesa, 3810-329 Aveiro, Portugal
mjmota65@hotmail.com

Resumo
Neste artigo damos a conhecer os resultados de um estudo realizado a duas peças têxteis tradicionalmente identificadas como sendo o escapulário e a túnica pertencentes ao hábito dominicano da Princesa Santa Joana. Tendo adquirido o estatuto de relíquias, desde a data da morte da Infanta (1490), ambas as peças foram, em 1701, acondicionadas num cofre relicário de prata e vidro, especialmente encomendado para o efeito. Toda a investigação realizada para este estudo teve por base o levantamento documental e bibliográfico relacionado com o culto da Princesa Santa Joana, culto esse iniciado logo após a sua morte. Para uma contextualização das peças têxteis e da sua função, optámos por fazer uma breve introdução sobre a importância e significado das relíquias, particularizando, em seguida, o culto das relíquias no Convento de Jesus de Aveiro, com enfoque naquelas directamente relacionadas com a Princesa Santa Joana. Este texto reúne, assim, as conclusões retiradas da informação recolhida e dos dados provenientes da observação e análise cuidada das peças.

Palavras-chave
Têxteis
Relíquia
Princesa Santa Joana
Hábito religioso
Cofre relicário

Textile treasures in the reliquary chest of Princess Santa Joana

Abstract
This article brings to light the results of a study undertaken on two textile objects which, according to tradition, are identified as the scapular and the tunic that belonged to the Dominican habit of Princess Santa Joana. Considered relics since the death of the princess (1490), they were stored in 1701 in a specially designed reliquary chest made of silver and crystal. The whole investigation was carried out on archival sources and published literature related to the worship of Princess Santa Joana, which begun immediately after her death. In order to contextualize the historical objects and their function, a brief introduction about the importance and meaning of the relics is made, while individualizing the worship of the relics in the Jesus de Aveiro Convent – especially those directly related with Princess Santa Joana. Therefore, this article gathers the conclusions achieved with the collected historical information and from the thorough examination of the textile objects.

Keywords
Textiles
Relics
Princess Santa Joana
Religious habit
Reliquary chest

ISSN 2182-9942

Conservar Património **31** (2019) 155-165 | https://doi.org/10.14568/cp2018030
ARP - Associação Profissional de Conservadores-Restauradores de Portugal
http://revista.arp.org.pt

Relíquias – significado e categorias

Raphael Bluteau, no seu *Vocabulario Portuguez & Latino* (1728), descreve o termo relíquias como sendo "pedaços de cruz e outras coisas sagradas, das quais usou Nosso Senhor Jesus Cristo na vida, ou as quais regou com seu divino sangue no tempo da sua paixão". Diz ainda que o mesmo termo designa um "corpo, ou alguma parte do corpo ou vestidura, ou outras coisas santificadas pelo contacto de algum santo" [1].

O culto das relíquias foi uma prática instituída e encorajada desde cedo pela Igreja Católica. Iniciado, segundo se pensa, no século II, depressa este tipo de culto se multiplicou e expandiu, atingindo o seu apogeu, na Idade Média, período de construção das grandes catedrais.

De acordo com as orientações da Igreja, as relíquias deviam inspirar à imitação de uma vida de virtudes, encorajando o crente à aproximação da conduta do santo venerado. Para serem exibidas, e simultaneamente protegidas do manuseamento indevido e do roubo, estes *tesouros* eram guardados em receptáculos selados, os relicários, os quais assumiam as mais variadas formas.

Numa sociedade assente no poder da igreja, no temor a Deus e no culto dos Santos, a presença de relíquias e a fama das suas propriedades miraculosas, facilmente atraiam novos fiéis e peregrinos aos espaços que as detinham, transformando-se, assim, numa fonte de poder, de riqueza e de prosperidade. Avultados donativos e esmolas iam contribuindo para o enriquecimento das instituições suas proprietárias.

Neste contexto, o papa Paulo III, em resposta às fortes críticas dos protestantes sobre o abuso do comércio de relíquias, no âmbito do Concílio de Trento (1545-1563), fez divulgar um conjunto de novas posturas conciliares relativas à invocação e veneração das relíquias. Entre outras disposições, foram definidas três ordens de grandeza. Assim, a relevância conferida a cada relíquia dependia agora da sua ligação, mais ou menos directa, a Cristo ou aos santos. Faziam parte da primeira, e mais importante, as diversas partes retiradas do corpo do santo, como sejam ossos, unhas, dentes, língua, cabelo, etc. Num plano imediatamente inferior valorizavam-se os objectos que tinham estado em contacto directo com o seu corpo, como vestes, elementos do martírio, pertences pessoais, etc. Finalmente, a terceira e última ordem, incluía os objectos que haviam tocado nas relíquias de primeira e segunda ordens, como sejam os próprios relicários [1].

Como resultado do reforço da importância espiritual das relíquias, as novas posturas tridentinas, acabariam por incentivar a que catedrais, igrejas e conventos procurassem granjear estatuto e riqueza através da posse destes testemunhos sagrados. Em muitas casas monásticas, sobretudo nas de maior prestígio, era comum várias relíquias serem expostas ou guardadas religiosamente sob a chave dos priores, ou na posse particular de alguns religiosos.

Testemunhos de relíquias no Convento de Jesus de Aveiro

A existência de relíquias no Convento de Jesus de Aveiro (1461) é referida praticamente desde a sua fundação. Testemunhas dos processos canónicos desenvolvidos com vista à beatificação e mais tarde à canonização da princesa Joana, relataram a existência de diversas relíquias guardadas no altar de S. Domingos do coro alto, bem como na sala de lavor, na sacristia e na posse particular de algumas irmãs [2]. Tratava-se de relíquias pertencentes a diversos santos, entre os quais daquela que desde logo foi intitulada como santa, a princesa Joana.

Como referem as diversas fontes documentais a que faremos alusão neste texto, algumas destas relíquias eram propriedade do convento, mas outras, retiradas pelas próprias freiras para fins particulares, conservavam-se na posse privada das religiosas [2]. Certo é que, independentemente de quem as detinha, era habitual as relíquias serem cedidas temporariamente a religiosas, deste ou de outros conventos, bem como à população em geral que, em hora de aflição, acedia à roda em busca de auxílio. Estes empréstimos, constituíam, por isso, uma importante fonte de rendimento para o convento, que, assim, via na multiplicação de relíquias um relevante meio para aumentar as suas receitas.

Inicio do culto e constituição das relíquias da princesa Joana

O Convento de Jesus de Aveiro, desde cedo reuniu mulheres da mais alta nobreza portuguesa, realidade à qual não foi alheio o facto de em 1472 ter dado entrada no convento a Infanta D. Joana (1452-1490), filha do Rei D. Afonso V e de D. Isabel [2].

Os primeiros anos desta casa secular, e a vida da princesa em particular, encontram-se descritos no texto intitulado *Memorial da Muito Excellente Princessa e Muito Virtuosa Senhora, ha Senhora Iffante Dona Johanna Nossa Senhora*. Trata-se de uma crónica escrita por Margarida Pinheira, religiosa que exerceu o cargo de sacristã no Convento de Jesus no tempo da princesa e que descreveu a vida do convento de 1461 a 1529, ano em que deixou Aveiro para ingressar num convento em Setúbal.

Apesar do seu ingresso na clausura, razões de Estado fizeram com que o Rei e a corte se opusessem determinantemente a que a princesa professasse, acabando esta por fazer apenas os votos religiosos em privado e vivendo uma vida monástica sujeita a regras semelhantes às das restantes *irmãs*, sem nunca esquecer o zelo pelos mais necessitados.

Tinha apenas 38 anos quando adoeceu gravemente. Na véspera da sua morte, a infanta, a sós com a prioresa D. Maria de Ataíde, pediu-lhe que, chegada a sua hora, a enterrasse, vestida com o hábito da ordem, na sala do coro-baixo [2]. Respeitando o seu desejo, após o seu

falecimento, as religiosas vestiram-na com "hábito e toucado de dominicana, como em vida, as mãos postas sobre o peito e as pontas dos pés a emergir das fímbrias de almáfega da Túnica" [2].

Em seguida, ao invés da habitual tumba ricamente ornamentada [3], a infanta foi enterrada, de acordo com o seu desejo, em campa rasa, junto ao comungatório do coro-baixo, sem cuidados especiais no seu ataúde, sendo este fechado com duas tábuas pregadas. Finalmente, o caixão foi coberto com terra e colocado um pano de lã preta sobre a sepultura [2].

A partir de então iniciou-se a veneração pela sua memória, com as freiras e a população a atribuírem-lhe milagres e prodígios. As manifestações de fé junto do túmulo tiveram início desde logo, sendo muitos os relatos de religiosas que, gravemente doentes, usavam a terra da sepultura para alívio dos seus males, sendo agraciadas com curas milagrosas [2-4]. Rapidamente a fama da sua santidade se propagou pela vila e arredores, estendendo-se a todo o país e chegando mesmo a outros reinos [2].

Em 1577, a cura prodigiosa da prioresa D. Jerónima de Castro deu azo a novas manifestações de fé. Terá sido este episódio que terá levado à primeira trasladação das ossadas da princesa. Assim, a prioresa, em agradecimento pela *graça* concedida, mandou recolher as ossadas num caixão em forma de baú, o qual foi inserido num outro caixão, e colocado sobre uma peanha de pedra no centro da sala do coro-baixo, cercado por grades de pau-preto. Aproveitando a ocorrência, as religiosas retiraram terra da sepultura para um vaso de barro, sendo este colocado no coro baixo junto ao túmulo [5]. Nesta mesma altura a sala foi lajeada com pedras muito largas cobrindo assim a sepultura primitiva [2].

A abertura do caixão sucedeu por diversas vezes, já que as freiras encontraram no manuseamento das relíquias uma forma de acudir às suas aflições. Uma testemunha do primeiro processo de beatificação relatou que, corria o ano de 1580, quando, estando sóror Madalena do Sepulcro muito doente, a levaram à campa "abriram o cofre da ossada da dita princesa, retiraram a caveira e meteram-na no estômago da doente" acabando esta por se curar [2].

No ano de 1599 foi realizado um novo esforço para melhoramento do túmulo, na época considerado demasiado mesquinho. Não tendo o convento os meios necessários para suportar tal empresa, D. Inês de Noronha, prioresa recentemente reeleita, dirigiu um pedido de ajuda ao rei D. Filipe II. O novo túmulo foi pago com os 50.000 reis, que, por ordem real, foram tirados do arrendamento das sisas da Vila de Esgueira referentes ao ano de 1601. Assim, em 1602, o caixão das relíquias foi guardado noutro de maior grandeza, em ébano, coberto de chapas de bronze dourado, sendo este colocado num supedâneo de pedra de Outil, cercado de grades torneadas com iguais ornatos de bronze. Aproveitando a ocasião da trasladação, mais uma vez foram retirados ossos e tecidos, destinados a fazer novas relíquias.

Os relatos das repetidas *graças* obtidas pelo contacto com as relíquias não passaram despercebidos aos superiores da Ordem Dominicana nem às autoridades eclesiásticas diocesanas, pelo que em 1626, foi dado o primeiro passo canónico para a beatificação da infanta, baseando-se este pedido na sua fama de santidade [5].

O processo de beatificação de um *servo de Deus* obrigava ao desenvolvimento de dois processos paralelos, o informativo, feito pelas autoridades do Ordinário (pelo prelado), e o apostólico, feito por autoridade da Santa Sé. Por outro lado, a elevação a beata podia ser justificada de duas formas: por virtudes heróicas ou milagres feitos por sua intercessão, ou por culto imemorial, sendo que este último pressupunha que a prova de culto tivesse mais de 100 anos ininterruptos.

Seguindo os trâmites legais, o processo completo de beatificação da princesa decorreu entre 1626 e 1693 e compreendeu na prática seis processos, sendo os três primeiros ordinários e os restantes apostólicos [5].

O primeiro processo foi requerido pela prioresa sóror Maria ou Mariana de Belém Coutinho e mais religiosas do Convento de Jesus, pela Câmara e pela nobreza da vila de Aveiro, e baseou-se nos relatos dos milagres ocorridos após a morte da princesa. Iniciado em 1626, foi juiz de causa o bispo de Coimbra D. João Manuel (1625-1633) [2]. O rol de testemunhas incluiu, entre outros, membros da mais alta nobreza e religiosas do Convento de Jesus. Pretenderam estas inquirições saber da autenticidade do livro de Margarida Pinheira, sacristã contemporânea da princesa, autora da crónica da fundação e da vida da princesa D. Joana, bem como testemunhar a veracidade das virtudes de santidade da princesa e dos relatos de milagres.

As várias testemunhas chamadas atestaram o primeiro milagre constante do processo, o da existência de um vaso colocado junto à grade do coro baixo onde era guardada a terra da sepultura da princesa. Estas testemunharam ser habitual muito povo visitar o seu sepulcro com grande devoção, pedindo terra da sua sepultura com o intuito de a usar na cura das suas enfermidades [6]. Testemunharam, ainda, que o mesmo faziam as religiosas e serviçais [5]. Igualmente confirmaram os efeitos milagrosos da terra da sepultura quando dissolvida em água e ingerida.

A terra, guardada num vaso de barro, fechado sob a chave da prioresa, era todos os anos retirada em grande quantidade, embrulhada em papel, e facultada aos enfermos. Milagrosamente, e sem nunca ser reposta, nunca se viu o nível da terra diminuir. Disso deram testemunho de fé numerosas testemunhas inquiridas ao longo do processo.

Outros milagres relatados no processo de beatificação diziam directamente respeito a outra relíquia, o cinto da princesa. Este era usado em mulheres com infecções ou em dificuldades de parto e no alívio de outros padecimentos, como febres, dores de ouvidos ou na cura de aleijados [5]. Muitas vezes as relíquias eram transportadas para o exterior do convento num cofre de marfim e levadas àqueles que padeciam, sendo posteriormente devolvidas ao convento. O mesmo acontecia com o crânio da princesa, por diversas vezes retirado do túmulo, cedido a

enfermos que, quando o colocavam sobre a zona doente, se viam curados das maleitas.

Em 1649, decorriam ainda as inquirições quando, ainda no âmbito do processo de beatificação, frei João de Vasconcelos, pregador régio e inquisidor do Tribunal do Santo Ofício, veio a Aveiro examinar as relíquias, procedimento indispensável num processo desta natureza. Retirando do túmulo os restos mortais da infanta, examinou-os e envolveu-os numa toalha de linho cosida e atada com fita de fios brancos, e colocou o envoltório novamente no caixão.

Apesar dos inúmeros testemunhos, a falta de rigor na apresentação do processo de beatificação acabaria por inviabilizar o sucesso da empresa, obrigando a uma mudança de estratégia. Neste sentido, em 1686 o processo foi retomado assentando já não na fama de santidade da princesa, mas na existência de um culto imemorial [2].

O novo processo informativo compreendeu quatro partes: um sumário das virtudes, culto imemorial, veneração e milagres da princesa Joana; a descrição das vistorias a espaços do Convento de Jesus e exame dos objectos e livros do mesmo convento; um traslado de partes dos textos de livros impressos referentes à vida e virtudes da princesa D. Joana; e o visto do processo pelo promotor de justiça e sentença do bispo D. João de Melo.

As inquirições à grade começaram no ano de 1687. No seu decurso surgiram relatos de relíquias guardadas pelas freiras num bauzinho de marfim, contendo o cinto ou correia da Santa princesa, sendo este emprestado para fora do convento para curar enfermidades ou situações de risco de parto. Outras testemunhas referiram que a madre prioresa possuía guardada numa boceta um cinto ou correia e alguns cabelos que tinham sido cortados numa das trasladações. Outra, ainda, afirmou que na primeira trasladação tinham sido retiradas várias relíquias como um estomático e cabelos, e colocadas em caixas e cofres de marfim que se encontravam debaixo da chave da prelada. Angélica Maria, testemunha no processo da cura do padre Filipe, é quem descreve pela primeira vez a relíquia designada por estomático ou estomagal. Tratava-se de uma espécie de colchão, atado com um cinto de tafetá encarnado, que era guardado num cofre de marfim. Este era pousado sobre o estômago dos enfermos para obter a cura de diversas maleitas [2].

De realçar que as relíquias não somente eram usadas para alcançar a cura milagrosa de doenças ou infertilidade, mas também para pedir o sucesso em negócios importantes [6]. Tais benesses eram, muitas vezes, agradecidas pelos crentes com generosos donativos em dinheiro ou em espécimes, o que resultava em importantes benefícios para o convento [7].

Em 1689, a visita do bispo conde D. João de Melo (1684-1704) a Aveiro, para preparação do processo canónico, revelou-se igualmente uma importante fonte de informação. No seu relato, o caixão exterior onde se encontravam os ossos relicários foi descrito como sendo em pau-preto com marchetados de bronze. Tinha dentro outro de pau pintado de azul com estrelas douradas e, dentro deste, um outro aberto e sem tampa também em madeira. Aí se encontraram as relíquias embrulhadas numa toalha de linho atadas com uma fita de linhas brancas. Nessa altura, o bispo adorou-as, deu-as a beijar às religiosas sem as descobrir e voltou a colocá-las no caixão. De seguida subiu ao coro-alto para examinar as restantes relíquias que se guardavam numa gaveta num altar de S. Domingos, juntamente com relíquias de outros santos e cuja chave estava na posse da prioresa [2]. Dentro encontrou uma bolsa de damasco carmesim com cordões de retrós. Embrulhado num tafetá amarelo estavam parte do escapulário e da camisa com que falecera a infanta, os quais haviam sido cortados para se darem aos devotos como relíquias. Num tafetá roxo, encontrava-se ainda um papel com uma madeixa de cabelos. Nessa altura foram retirados alguns cabelos para serem enviados ao rei e à rainha, bem como outras relíquias para serem enviadas para Roma [6].

Passando à sacristia (sala do tesouro no 1.º andar, ao lado da capela-mor), foi verificado o cofre de marfim marchetado, habitualmente guardado num armário junto dos cálices. Aí se mantinha uma bolsa de veludo encarnado, com uma fita que lhe servia de cordão, tendo duas relíquias no seu interior: o cinto de couro coberto e forrado de chamalote azul com uma trancinha de ouro e fechos de prata, e o estomagal acondicionado num tecido de tafetá azul.

Entretanto, o processo de inquirição de testemunhas teve o seu seguimento noutras zonas do país, nomeadamente no convento dominicano de Lisboa. Vários testemunhos de frades atestaram a utilização de relíquias da princesa para a cura de vários males de saúde. Foi o caso de frei Bento de Santa Catarina, que relatou que, estando doente frei Diogo da Encarnação, lhe dera uma relíquia de parte da camisa da princesa e que este a tomou com tanta fé que no outro dia se sentiu melhor, mandando-lhe fazer um retábulo [2].

A instrução do processo continuou com a junção de documentos e provas, tendo este sido fechado a 13 de Junho e entregue à Sagrada Congregação.

A 4 de Abril de 1693 e com o auxílio do rei D. Pedro II, o papa Inocêncio XII passou finalmente o breve de beatificação da princesa, concedendo-lhe o culto no país inteiro e na Ordem dos Pregadores.

Passados apenas quatro anos, a prioresa do Convento de Jesus, Mariana de S. Joseph, e o prior de S. Domingos, frei Pedro Monteiro, dirigiram-se a Lisboa com o intuito de expressar ao rei D. Pedro II a vontade de erigir um mausoléu digno das relíquias da princesa.

Na sequência deste pedido, El-rei não só encarregou o prior de S. Domingos da direcção de obra, como solicitou ao arquitecto real João Antunes que desenhasse o túmulo, mandando igualmente que se renovassem as paredes e tecto da sala do coro [2]. Corria o ano de 1698.

Em 1701, foi sóror Isabel da Visitação quem mandou lavrar um cofre relicário para colocar o escapulário, a túnica e o cinto com que tinha morrido a princesa. A

partir de então, o cofre passou a ser facultado à grade, para socorrer as mulheres em dificuldades de parto, com problemas de fertilidade, bem como para auxiliar na cura de doenças.

A 28 de Agosto de 1711, foi finalmente aberto o caixão na presença do bispo D. António de Vasconcelos e Sousa (7.º neto de Afonso V e 6.º sobrinho da princesa) e colocadas as relíquias à veneração. Crânio e ossadas foram passados de uma toalha de linho para uma de cambraia e metidos num caixão de veludo carmesim. Antes de fechar o túmulo foram colocados, no interior, os caixões sucessivos em que haviam estado as ossadas, bem como o termo de autenticação das relíquias devidamente assinado, ficando dele treslado no cartório do convento. Só então foi fechado o último caixão com três chaves, ficando estas na posse do bispo conde, do rei e da prioresa.

Não tardaram muitos anos para que se iniciassem esforços no sentido de obter a canonização da princesa. Em Maio de 1740 a prioresa D. Arcângela Maria retomou a causa, pedindo ao rei que concorresse com o seu real patrocínio e ajuda. Contudo, as difíceis relações da Santa Sé com a coroa portuguesa (1720-1723) acabaram por esfriar o processo, e só em 1749 se iniciaram as novas inquirições e reunião de provas [2], vindo o processo a estar concluído e a ser enviado para Roma em 1752, já

Figura 1. Cofre relicário em prata e vidro, que encerra o escapulário, a túnica e o cinto do hábito da Princesa Santa Joana. Fotografia: Museu de Aveiro.

com a prioresa sóror Paula de Jesus. Todavia, este nunca chegaria a ser concluído em Roma [5].

Corria o ano de 1750 quando o túmulo foi aberto pela última vez na presença do bispo conde, procedendo-se novamente ao exame das relíquias [2]. Desta vez tomaram-se precauções canónicas para evitar que fossem retiradas mais relíquias, promulgando-se a pena de excomunhão para quem o fizesse. Durante a cerimónia, junto à grade, tocaram-se nas relíquias com inúmeros objectos e distribuiu-se a água com que se haviam lavado os ossos.

Para além das ossadas do túmulo foram ainda analisadas outras relíquias, muitas constituídas por ossos guardados pelas freiras, que assim foram chamadas a apresentá-las como testemunhos [2]. Na sacristia foi aberto o cofrezinho de marfim com o estomático e ainda o cofre de prata com a camisa, o escapulário e o cinto da princesa, a que já fizemos referência.

Como facilmente pudemos verificar pelas inquirições feitas no âmbito dos diversos processos de beatificação e canonização, e pelos testemunhos das diversas trasladações, a dispersão e consequente multiplicação das relíquias, por fraccionamento ou contacto com tecidos ou receptáculos envolventes, foi frequente e inevitável. Em cada abertura foram retiradas relíquias, parte para distribuir pelas religiosas, outras destinadas a bustos relicários, cruzes, etc. [2]. De realçar que às datas de 1577, 1580, 1602, 1640, 1689, 1711, 1750, anteriormente referidas, deverão ser ainda acrescentadas as aberturas particulares feitas pelas religiosas, das quais, a ocorrida em 1586 com a doença da madre Madalena do Sepulcro foi apenas um exemplo [2].

Como consequência, vários relicários foram mandados fazer no período de vida do convento para guardar relíquias da princesa, tendo dois deles sido integrados na colecção de talha do Museu de Aveiro, museu este instalado do edifício do antigo Convento de Jesus. O primeiro, um quadro relicário em talha dourada com frente envidraçada (n.º de inv.º 548/B), datado do século XVIII, contém relíquias de vários santos, entre as quais uma da princesa Joana. O segundo, um prisma relicário de madeira e vidro, do século XVII-XVIII, parte de um conjunto de quatro peças idênticas, guarda, entre outras relíquias, um osso e um fragmento de pelica da uma luva da princesa.

O cofre relicário

Como já referido anteriormente, a concessão de *graças* associada ao uso das relíquias levou a que, em 1701, a prioresa D. Isabel da Visitação encomendasse a feitura de um cofre de prata para acondicionar as relíquias até aí conservadas no altar de S. Domingos do coro alto, e na sacristia [2] (Figura 1). Esta peça (23,5 cm × 14,1 cm ×

Figura 2. Inscrição da base do cofre: “sendo. prioreca am. sor. Izabel. davisitação. Na.1701”. Fotografia: Museu de Aveiro.

Figura 3. Estojo do cofre relicário em madeira, pergaminho e tecido. Fotografia: Museu de Aveiro.

24,7 cm) encontra-se desde 1912 integrada na colecção de ourivesaria do Museu de Aveiro (n.º de inv.º 2/D), sendo uma das relíquias transportadas anualmente na procissão de 12 de Maio, dedicada à padroeira da cidade, a Princesa Santa Joana.

De ourives desconhecido, é feito em prata fundida, puncionada, cinzelada e incisa e apresenta as faces em vidro, sendo a tampa rematada pelas armas reais portuguesas e pelas armas dominicanas. A tampa, amovível, fecha com elementos em rosca nos quatro cantos da peça. No fundo do cofre destaca-se a inscrição "sendo. prioreca am. sor. Izabel. davisitação. Na.1701", mandada gravar pela encomendante (Figura 2).

Também da encomenda do cofre constou certamente o estojo que o protege (Figura 3). Feito em madeira, é forrado exteriormente com pergaminho pintado e no interior com tecido de damasco vermelho. Dada a permanência do cofre no convento e a frequência com que o este terá sido aberto em situações de aflição, é natural que o estojo tenha tido pouca serventia. Contudo, teve certamente um papel fundamental na conservação da peça, nomeadamente no período das invasões francesas (1808). Nesta altura, mandou Napoleão que os seus generais recolhessem todas as pratas e demais bens preciosos das igrejas, capelas e confrarias e que os encaminhassem para a Casa da Moeda para serem fundidos. No caso das regiões da província, as peças deveriam ser entregues na casa dos recebedores das décimas, os quais as remeteriam para Lisboa. Cumprindo o estabelecido, as religiosas viram-se, também elas, obrigadas a entregar diversas alfaias, conseguindo, no entanto, enterrar algumas de maior valor, nomeadamente o cofre e outras peças de ourivesaria, no canavial junto à cerca, salvando-as assim da rapina francesa [2].

Relíquias: escapulário, túnica e cinto

Tal como noutros conventos, logo após a sua fundação, o Convento de Jesus de Aveiro foi dotado de um conjunto de regras destinadas a reger o quotidiano conventual, regras essas vulgarmente designadas por *Constituições*. Estas, abrangiam os mais variados aspectos da vida religiosa, sendo desde logo um dos capítulos dedicado ao uso do vestuário no interior da clausura. Assim na *regra* pode ler-se:

> As nossas freyras trazeram vestiduras de laam honestas, e que nom sejam notavelmente prezadas e rriquas, e princjpalmente se goarde a villeza do uestido, nos mantos de cyma. Podem trazer pellico antre as duas sayas, o qual seja mays curto que cada huma dellas. […] As sayas de cima cheguem ates os calcanhares. E os scapulayros com que sempre deuem andar, sejam mays curtos que as sayas. Tenham cocos, cubertura da cabeca e ueeos, segundo for necessareo, e a fazenda da casa sofrer. Nom tenham luuas [2].

Este texto, contemporâneo da princesa, permite-nos conhecer com grande pormenor as diferentes peças que compunham o hábito dominicano, os materiais em que eram confeccionadas, bem como as regras obrigatórias para o seu uso.

A partir desta informação, consultámos a descrição do *Memorial* sobre as peças encerradas no cofre relicário. Refere esta fonte documental que o cofre encerrava uma "parte do hábito, o rosário e outras peças de vestuário da princesa Santa" [8], deixando a ideia de que às peças hoje conhecidas se juntariam outros elementos do hábito da princesa. Esta será, contudo uma possibilidade pouco verosímil dada a ocupação da totalidade do espaço interior do cofre.

De facto, a recente abertura do cofre revelou no seu interior a existência de apenas duas peças têxteis, um escapulário e uma túnica, bem de como um cinto de couro (Figura 4).

É sobre estas peças que nos iremos debruçar com mais atenção.

Figura 4. Abertura do cofre relicário. Fotografia: Ana Andrade.

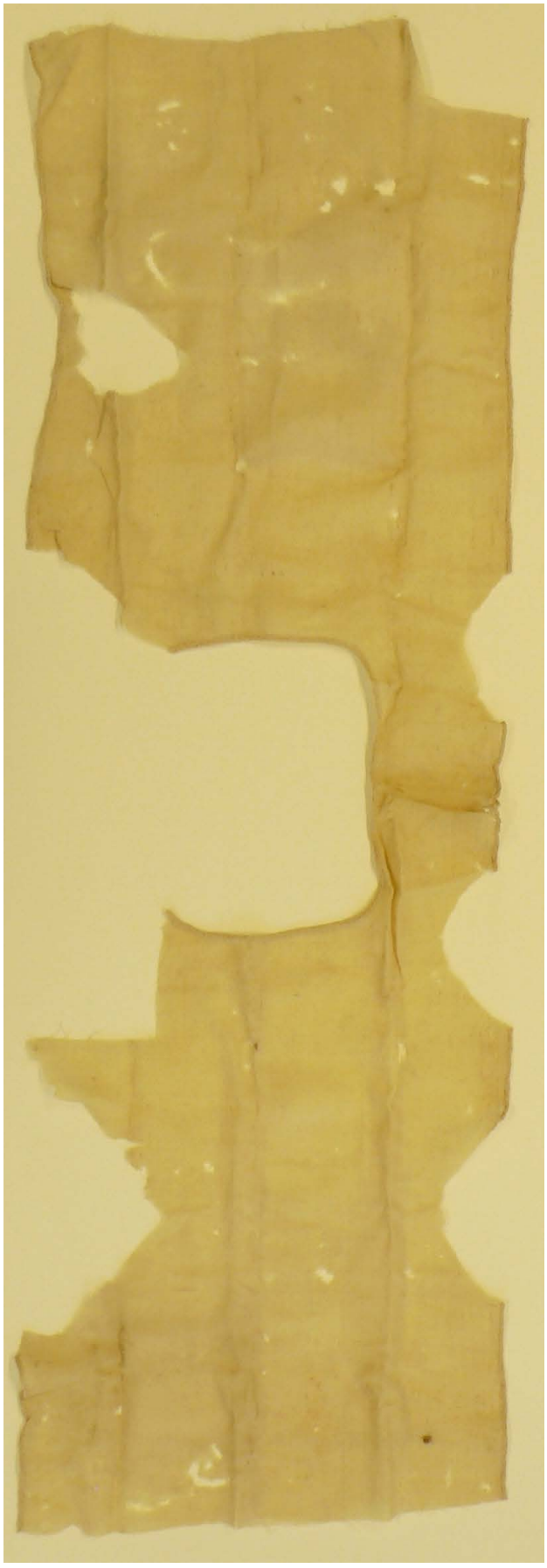


Figura 5. Escapulário pertencente ao hábito da Princesa Santa Joana. Fotografia: Ana Andrade.

O escapulário, veste que integra o hábito de várias ordens religiosas, consiste numa longa tira de tecido, usada sobre a túnica, com abertura a meio para inserir a cabeça, de forma a cair sobre o peito e sobre as costas.

A peça encerrada no relicário (Figura 5), sendo tecida em lã de tom cru, apresenta um padrão geometrizado (Figura 6). O decote é quadrangular, com os cantos arredondados. Ambas as faces, anterior e posterior, se encontram truncadas, sensivelmente a meia altura da peça, apresentando ainda significativas falhas de material resultantes de cortes feitos com tesoura. Esta ausência de material justifica-se, seguramente, pelas diversas subtracções de tecido, realizadas intencionalmente com o intuito de fazer novas relíquias. Sem possibilidade de proceder a uma análise laboratorial da peça, e centrando-nos, mais uma vez, na investigação documental, foi encontrado, no arquivo administrativo não classificado do Museu de Aveiro, um registo datado de 1985 relatando a deslocação ao museu da então técnica responsável pelo Departamento de Restauro de Têxteis do Instituto José de Figueiredo, senhora D. Maria José Taxinha. Segundo essa mesma nota, a especialista terá dado como provável o escapulário ser do século XV, já que se tratava de uma tecelagem idêntica à observada no loudel de Rei D. João I, peça com datação já confirmada. Tal informação, a comprovar-se, posicionaria a peça entre 1473 e 1490, anos correspondentes à sua entrada para o convento e à sua morte, respectivamente. De realçar, no entanto, que esta é apenas uma hipótese carecendo de confirmação laboratorial.

Já relativamente à túnica (1,30 m de altura × 2,55 m de largura) (Figura 7), verificou-se ser uma peça de linho, em tafetá, com corte evasé e decote raso, totalmente aberta na parte posterior, fechando com atilhos (Figura 8).

Tal como o escapulário, também a túnica se encontra incompleta, faltando-lhe a totalidade da parte posterior e uma parte na zona inferior da manga direita, certamente

Figura 6. Pormenor do tecido do escapulário. Fotografia: Ana Andrade.

Figura 7. Túnica pertencente ao hábito da Princesa Santa Joana. Fotografia: Ana Andrade.

pelas mesmas razões acima apresentadas (Figura 9). Neste caso, a vulgaridade do tecido e da técnica de tecelagem tornam ainda mais difícil a sua datação. Será, contudo, importante referir que as costuras de ambas as peças (Figura 10) são em tudo semelhantes e ambas apresentam pequenas manchas acastanhadas que, segundo a crónica, seriam manchas de sangue decorrentes da doença que teria provocado a morte da infanta, a tuberculose (Figura 11). Sem acesso a recursos laboratoriais, foram feitos testes simples com água oxigenada sobre várias destas manchas para observar a reacção às enzimas que atuam por oxidação (oxidases). O facto de os testes não terem dado a efervescência habitual de um teste positivo, pode ser justificado pela antiguidade das manchas (Figura 12). Apesar de não nos ter sido possível fazer outro tipo de análises, já que tais procedimentos acarretariam custos incomportáveis no âmbito desta investigação, o interesse em sujeitar ambas as peças a exames laboratoriais profundos, com vista à aproximação à data de fabrico, é por demais evidente.

Tendo tido conhecimento que em Portugal a datação de têxteis é feita exclusivamente por radiocarbono, ou carbono-14, e que a única instituição científica apta a fazê-lo é o Instituto Tecnológico e Nuclear (ITN), contactámos o director do Laboratório de Engenharia Nuclear (LEN) e Vice-Presidente do IST para o pólo de Loures, Professor Doutor José Gonçalves Marques, para indagar dessa possibilidade. Fomos informados de que esta não seria a metodologia mais indicada para este caso específico, na medida em que o exame obrigaria à recolha de uma amostra com 1 grama de carbono, o que resultaria na destruição de uma

Figura 8. Pormenor do tecido da túnica. Fotografia: Ana Andrade.

quantidade apreciável de tecido. Foi-nos então sugerido fazer uma análise através de espectrometria de massa com acelerador (AMS), um método usado nalguns centros de investigação tecnológicos europeus e que se revela menos destrutivo, já que utiliza amostras de menor dimensão (cerca de 10 mg). Infelizmente, apesar dos esforços desenvolvidos pelo LEN junto de outros laboratórios europeus, não conseguimos quaisquer resultados a tempo da publicação do presente artigo.

Finalmente o cinto ou, como por vezes surge designado na documentação antiga, a correia, é constituído por uma estreita tira em pele castanha escura, de 8 por 3 cm (Figura 13). Este apresenta seis furos contornados por aplicações losangulares em prata, com decoração em resplendor. Destes seis furos, cinco são sequenciais, estando o sexto localizado na extremidade da peça, rematada em bico. A outra extremidade do cinto foi cortada, tendo apenas um pequeno orifício na ponta (Figura 14). Conforme já referido, o cinto era usado frequentemente para pedidos de auxílio de graças, nomeadamente, nas dificuldades de parto, situações de infertilidade ou outro tipo de aflições. Sabemos que antes da encomenda do cofre relicário de prata onde foi guardada esta relíquia, existia um outro cofre mais antigo onde este era transportado para fora da clausura, sendo depois devolvido à comunidade.

Figura 9. Pormenor dos cortes realizados na manga da túnica. Fotografia: Ana Andrade.

Figura 10. Pormenor das costuras da túnica, idênticas às do escapulário. Fotografia: Ana Andrade.

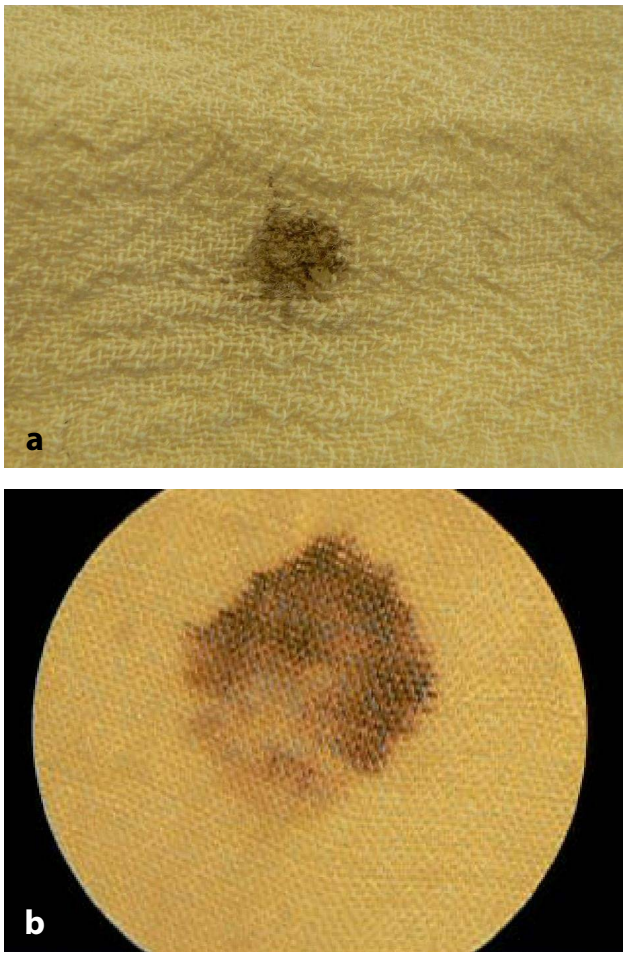


Figura 11. Exemplo de uma das manchas do que se pensa poder ser sangue da princesa Joana *(a)* e visão microscópica *(b)*. Fotografia: Ana Andrade.

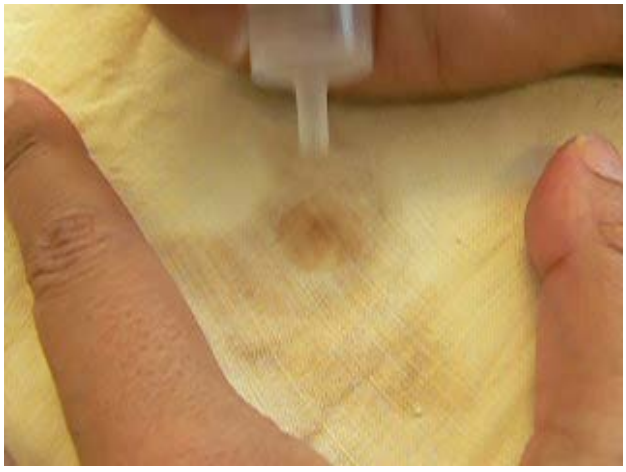


Figura 12. Teste realizado com água oxigenada na mancha do que poderá ser sangue da princesa. Fotografia: Ana Andrade.

Figura 13. Cinto pertencente ao hábito da Princesa Santa Joana tal como se apresentava no interior do cofre. Fotografia: Ana Andrade.

Figura 14. Cinto do hábito em toda a sua extensão. Fotografia: Ana Andrade.

O facto de se encontrar incompleto deverá, mais uma vez, ser resultado de uma necessidade de criação de novas relíquias, tal como terá acontecido com as duas peças anteriores.

Em conclusão, e após uma aturada análise documental e bibliográfica do percurso das relíquias da princesa no Convento de Jesus ao longo de cinco séculos, e da observação directa e cuidada das peças presentemente acondicionadas no cofre relicário, julgamos existir uma forte probabilidade de poderem tratar-se realmente de testemunhos do século XV, pertencentes à princesa Joana. Contudo, apenas uma investigação mais completa com recurso a uma análise laboratorial das peças, poderá confirmar estas fortes suspeitas.

Sendo de todo o interesse, numa altura em que se reabriu o processo canónico para a santificação da princesa D. Joana, poder concluir-se este estudo, e clarificar quaisquer dúvidas que ainda persistem, deixamos aqui o repto para que, aproveitando as sugestões do Professor Doutor José Marques, que incansavelmente nos ajudou a encontrar uma solução para a datação dos têxteis, se possam vir a submeter as peças a uma análise por espectrometria de massa com acelerador na ETH Zurique, de forma a obter a real datação das peças.

Referências

1 Bluteau, R., *Vocabulario Portuguez & Latino: Aulico, Anatomico, Architectonico*, vol. 8, Coimbra (1721).

2 Santo, D.M., *O Mosteiro de Jesus de Aveiro*, Companhia de Diamantes de Angola, Lisboa (1963-1965)

3 Buescu, A. I., 'A morte do rei. Tumulização e cerimónias de trasladação dos reais corpos (1499-1582)', *Ler História* **60** (2011) 9-33, https://doi.org/10.4000/lerhistoria.1443.

4 Madahil, A. G. R., 'Auto da vida de Santa Joana', *Arquivo do Distrito de Aveiro* **35** (1969) 113-121.

5 Neves, F. F., *O Primeiro Processo para a Beatificação e Canonização da Princesa Santa Joana, Filha do Rei Afonso V*, Aveiro (1958).

6 Neves, F. F., *O Processo Informativo de 1687 para a Beatificação e Canonização da Princesa Santa Joana, Filha do Rei D. Afonso V*, Aveiro (1959).

7 Madahil, A. G. R., *Crónica da Fundação do Mosteiro de Jesus, de Aveiro e Memorial da Infanta Santa Joana, Filha do Rei D. Afonso V (Códice Quinhentista)*, Aveiro (1939).

8 Gomes, M., *Catálogo da Exposição de Arte Religiosa no Collegio de Santa Joana Princeza, em Beneficio dos Pobres de Aveiro*, Aveiro (1895), pp. 8 e 80.

Recebido: 2018-7-3
Revisto: 2018-10-8
Aceite: 2018-12-6
Online: 2018-2-5

Estudos sobre têxteis históricos
Studies in historical textiles
A. Serrano, M. J. Ferreira, E. C. de Groot (ed.)

Nota / Note

Originalidade e autenticidade de têxteis em museus-casa

Luz Neira-García

Investigadora independente, Milano, Italia
luz.neira.garcia@outlook.com

Resumo
Este artigo resulta do Projeto de Renovação Museográfica do Museu Casa de Rui Barbosa, no Rio de Janeiro. Nesta abordagem, discute-se a introdução de têxteis não-originais na museografia da instituição, uma vez que a pesquisa demonstrou a descaracterização parcial dos ambientes. Do ponto de vista teórico, a ideia é sustentada pela premissa que os têxteis decorativos são fundamentais para a narrativa museográfica. Desde essa perspectiva, são apresentadas algumas reflexões sobre a originalidade versus não-originalidade da tipologia têxtil dentro dos museus-casa.

Palavras-chave
Têxteis decorativos
Museu-casa
Autenticidade
Originalidade
Museografia

Originality and authenticity of textiles artefacts in house-museums

Abstract
This article is a result of the Project for the Museographic Renewal of the Rui Barbosa House Museum, in Rio de Janeiro. This approach discusses the introduction of non-original textiles in the museum, since previous research has demonstrated that its environment is partially featureless. From the theoretical point of view, the idea of renewal is supported by the assumption that decorative textiles are necessary to build the narrative in the museum. From this perspective, some reflections are presented here about the originality versus non-originality of the textile typologies inside historical houses.

Keywords
Decorative textiles
Historical house
Authenticity
Originality
Museography

ISSN 2182-9942

Conservar Património **31** (2019) 167-176 | https://doi.org/10.14568/cp2018020
ARP - Associação Profissional de Conservadores-Restauradores de Portugal
http://revista.arp.org.pt

Introdução

A exibição de objetos não-originais em museus é um tema que estimula um amplo debate. É praticamente um assunto tabu, pois evidencia a impotência científica frente à deterioração dos materiais e também deflagra o cuidado insuficiente que, eventualmente, gerações anteriores de profissionais que atuaram na área de museografia tiveram com esses objetos que hoje são considerados valiosos e intocáveis. Dentro desse contexto, cada vez mais a museologia procura desenvolver meios alternativos de acesso aos artefatos, o que inclui aprimorar técnicas de preservação, restringir o acesso a objetos e, por fim, criar meios de substitui-los por não-originais visando seu estudo ou sua exibição.

Essa consideração introdutória torna-se ainda mais intensa quando nos referimos aos artefatos têxteis, sejam eles fragmentos ou peças de tecidos, roupas, móveis, acessórios ou objetos decorativos entre outros. Dentro da ciência da conservação, é consenso que o têxtil é uma espécie material extremamente frágil que, sobretudo quando de origem orgânica, é afetado velozmente por transformações físicas que extraem dele seu potencial comunicativo. Tecidos desgastados, desbotados, manchados etc., ainda que existam, deixam de ser expressivos nas narrativas museográficas, pois sua deterioração material e visual modifica-os substancialmente.

Desde essa perspectiva, pensar a renovação dos têxteis do Museu Casa de Rui Barbosa, no Rio de Janeiro, Brasil, tornou-se uma opção dentro do Projeto de Renovação Museográfica, que tinha por objetivo potencializar a museografia da instituição. Obviamente a direção do Projeto se baseava em questões éticas e técnicas previamente estabelecidas, assuntos esses que não são debatidos no artigo, que limita-se a discutir a função museográfica dos têxteis não-originais na museografia.

Assim, em 2009, a partir do confronto entre os registros fotográficos datados dentre 1895 e 1923 e a situação dos ambientes naquele momento (2009), a equipe de museólogos concluiu que o Museu Casa de Rui Barbosa encontrava-se parcialmente descaracterizado, como pode ser observado quando comparamos o quarto de vestir de Dona Maria Augusta em 2010 (Figura 1a) com a fotografia de 1923 (Figura 1b). O Projeto destacava que os tecidos decorativos eram imprescindíveis na caracterização das casas privadas finisseculares e que sua ausência alterava a percepção do visitante tanto sobre a vida privada de Rui Barbosa quanto da sociedade carioca de então. Assim, o Projeto de Renovação Museográfica, entre outros objetivos, suportou o desenvolvimento de uma investigação que visava a identificação dos têxteis que teriam decorado a casa onde viveu o mais emblemático político e jurista brasileiro durante 28 anos.

Segundo as fontes documentais existentes (fotografias, faturas, cartas e outros), entendeu-se que os têxteis decorativos da casa de Rui Barbosa materializariam importantes conceitos do processo de modernização da sociedade brasileira. Os objetos que a decoraram espelharam os valores vigentes naquele período e sua presença no museu-casa, portanto, permitiria que o visitante contemporâneo entrasse em contato com tal realidade. Desde a morte de Rui Barbosa (1923), passando pela fundação do museu (1930) e pelo contexto do desenvolvimento do Projeto e da pesquisa (2009 e 2010-2012), os têxteis decorativos do palacete foram desgastando-se ou desapareceram totalmente, tornando a museografia empobrecida e a experiência da visitação incompleta. Também, com a passagem dos anos, diferentes perspectivas museográficas interferiram nos tecidos dos ambientes, descaracterizando-os parcialmente e distanciando a experiência da visitação do modo de vida de Rui Barbosa e de sua família. Os museólogos da instituição sabem que equipes profissionais anteriores também renovaram os ambientes; porém, conforme apontado pelo Projeto, essa renovação foi feita com base no que se imaginava ou se havia documentado sobre o período de referência, mas também carrega o próprio gosto decorativo ou a premissa museográfica do período na qual a renovação foi feita.

Assim, foi a partir de *objetos ausentes* que a pesquisa identificou tipologias de tecidos que teriam decorado a casa [1]. Constatada a relevância dos têxteis para representar o modo de vida de Rui Barbosa e de sua família, teve início o debate sobre a inserção de artefatos não-originais na museografia do museu-casa. Este artigo se debruça especificamente sobre os questionamentos decorrentes do eminente uso de artefatos têxteis não-originais no museu-casa, na expectativa de que o Projeto de Renovação Museográfica se concretizasse. Segundo relatório oficial da instituição, a realização de parte do Projeto de Renovação Museográfica está proposta pelo Plano Museológico 2018/2021.

O Projeto de Renovação Museográfica (2009) defendia que a visitação ao Museu Casa seria enriquecida com a renovação dos artefatos têxteis, pois eles possibilitariam que o público tivesse uma melhor percepção do modo de vida daquela família. Do ponto de vista dos estudos da cultura material, entendeu-se que os conceitos intelectuais da família de Rui Barbosa expressaram-se nas suas escolhas decorativas, uma vez que o ambiente físico é modificado através de nosso comportamento cultural [2]. A ideia de renovar os ambientes, portanto, não significaria atualizá-los ou reformá-los, mas sim reincorporar a eles objetos – materiais, texturas, cores, saturação, composição etc. – que representavam as escolhas intelectuais de Rui Barbosa.

De fato a pesquisa realizada identificou a ausência de mais de uma centena de têxteis nos ambientes privados e sociais da casa. Ainda, concluiu-se também que Rui Barbosa tratava pessoalmente e com gosto da escolha da decoração e que, no período, sua casa foi importante cenário para suas atividades profissionais; sem uma decoração adequada, acredita-se, parte dessa sociabilidade não teria se realizado.

Isto posto, a grande questão colocada pelo Projeto é que ele supõe trazer ao museu-casa artefatos têxteis que

Figura 1. Quarto de vestir de Maria Augusta (a esposa de Rui Barbosa) em 2010 (a) e 1923 (b). Enquanto a fotografia de 1923 revela um ambiente saturado de têxteis, o diagnóstico do projeto de investigação mostra o esvaziamento do ambiente. Neste caso, o quarto pode comprovar a perda de comunicação museográfica diretamente relacionada com o desaparecimento dos têxteis funcionais e decorativos. Fonte da fotografia de 1923: acervo da Fundação Casa de Rui Barbosa publicada na *Revista Paratodos* por ocasião da morte de Rui Barbosa (1923).

jamais lhe pertenceram, problemática esta que é o foco deste artigo. Ao constatar que o museu-casa não conta mais com as inúmeras tipologias têxteis que decoraram a casa; acreditando que elas são imprescindíveis para a experiência da visitação, pois também o eram para os habitantes da casa; sendo evidente a impossibilidade de recuperá-los no sentido de sua originalidade, é necessário refletir sobre a alternativa de incorporar artefatos não-originais ao museu-casa, para que estes cumpram um papel comunicativo na narrativa museográfica.

De acordo com a pesquisa realizada, o acervo inexistente que visávamos reestabelecer teria sido constituído por, no mínimo, de 150 tecidos distribuídos em mais de 50 tipologias de têxteis que foram categorizados segundo seu modo de produção seguindo parâmetros teóricos utilizados por alguns historiadores do design como Adrian Forty [3]. Para os historiadores sociais do design, os modos de produção dos artefatos são parte fundamental da atribuição dos significados que eles carregam e essa categorização foi transposta às tipologias têxteis identificadas na pesquisa. Assim, quando os têxteis da casa tivessem sido produzidos sobretudo pelas mulheres e assumissem caráter de manualidade foram categorizados como domésticos (praticamente equivalentes aos artesanais mencionados por muitos historiadores do design); quando tivessem sido produzidos mecanicamente e em série foram definidos como industriais; e, finalmente, se produzidos como um objeto único, autoral, proprietário de valor intangível, foram equiparados a outros objetos de valor artístico.

No total, a casa teria sido decorada por aproximadamente 120 diferentes artefatos têxteis, sendo que a maioria deles não toma mais parte do acervo do museu-casa e são de difícil identificação. São poucos os exemplares têxteis originais ainda existentes no museu-casa: o *gobelin* original com desenho de François Boucher, no Salão de Festas; um tapete adquirido na Argentina, também no Salão de Festas; e os estofamentos de um conjunto de canapés e cadeiras na sala de música, de veludo estampado de procedência inglesa, cuja origem, foi identificada pelo Professor Philip Sykas. Além desses, a forração de uma cadeira nessa mesma sala, que foi identificada como uma tapeçaria atribuída a William Morris, encontra-se em um estado de conservação bastante precário e sobre a qual não há maiores informações. Os demais itens identificados simplesmente desapareceram (não estão mais no museu-casa) ou nunca pertenceram ao museu-casa (mas somente à casa); ou, ainda, foram substituídos por equipes anteriores. Esse processo não foi satisfatoriamente documentado e, portanto, a pesquisa não pode assumir conclusões claras. Desse modo, todos esses artefatos seriam objeto e problema da renovação museográfica.

Supondo que não restasse mais nenhuma dúvida do ponto de vista ético sobre a utilização de artefatos não-originais na museografia, teria início o processo de escolha desses tecidos. Evidentemente o ponto crucial seria o de definir, do ponto de vista material, como renovar os ambientes, isto é, quais tecidos poderiam repor as espécies ausentes no contexto de um museu-casa, uma vez que os critérios que definiram as tipologias mencionadas (domésticas, artísticas ou industriais), poderiam não ser mais disponíveis ou simplesmente não se reproduzir no processo de renovação museográfica. Assim, para definir quais tecidos poderiam contribuir para a narrativa museográfica seria necessário assumir alguma postura frente ao papel que os têxteis não-originais assumiriam na museografia. Tendo em mente que a instituição tem uma função educativa relevante, poderia haver flexibilização científica ou histórica?

O desenvolvimento desse tema é tratado neste artigo por meio de dois tópicos distintos. Primeiramente contextualiza-se e sustenta-se a ideia de que os têxteis são fundamentais para o desenvolvimento da narrativa nos museus-casa e, em segundo lugar, reflete-se sobre a relação entre os não-originais e a narrativa museográfica. A compreensão da problemática maior da pesquisa pode ser alcançada pela leitura de artigos complementares que apresentam a complexidade de um projeto de renovação museográfica dedicado aos têxteis.

Têxteis decorativos, a narrativa nos museus-casa e a problemática da renovação museográfica: considerações iniciais a partir do Museu Casa de Rui Barbosa

A intenção de propor ao público do Museu Casa de Rui Barbosa uma experiência de visitação enriquecida pelos têxteis decorativos adequados baseou-se num dos principais pressupostos da museologia, que é a de "tomar como certo a relação entre a visualização de itens em um museu e a aquisição de conhecimento" [4]. Na maioria das vezes, entretanto, experiência do conhecimento está associada com a originalidade do objeto, uma vez que nos museus os artefatos têm sido alçados à categoria de documentos.

Essa questão vem sendo discutida por especialistas e, embora se acredite que "a autenticidade não é inerente ao objeto" mas sim "uma construção cultural", ela é muito valorizada pela cultura ocidental contemporânea e desejada pelo público visitante dos museus [5]. Paradoxalmente, o visitante não usufrui nos museus do objeto-documento ou de sua suposta originalidade, mas sim de seu valor informacional que resulta de suas propriedades concretas e perceptíveis [6] que, em geral, são passíveis de serem reproduzidas em artefatos não-originais. De um ponto de vista teórico, portanto, é possível afirmar que artefatos originais e não-originais nos museus possam cumprir o mesmo papel didático, que é o de apresentar materialmente conceitos intelectuais, sejam eles históricos ou estéticos.

No caso dos museus-casa, onde o que a museologia e os visitantes perseguem não é exatamente ver objetos em especial, mas sim aproximar-se de um determinado modo de viver, pode-se contestar ainda mais a importância da originalidade.

> Uma distinção necessita ser feita entre casas históricas e museus de objetos. A grande parte de casas históricas foram grandes casas e agora exibem uma seleção de ambientes e decoração para o público. A cor da pintura original em alguns desses ambientes pode ter sido determinada pela raspagem da pintura e reproduzida por uma empresa especialista, mas a mobília e artefatos são organizados de modo que sugerem o gosto e interesse de várias gerações da família, o que pode abarcar um ou dois séculos. Improvisações são completamente aceitáveis nesse contexto. Um gestor da *National Trust* recentemente explicou que, para ele, a autenticidade tinha somente um pequeno significado na apresentação da história da casa: *preservar atitudes* era bem mais importante, uma aproximação apelando pela criatividade contemporânea [7].

O que parece fundamental, entretanto, é que artefatos e narrativa histórica sejam coerentes. Uma vez que o ambiente físico é modificado por nosso comportamento cultural, são os objetos decorativos – por serem escolhas pessoais – que têm especial relevância na missão de *preservar atitudes* e apresentar ao visitante o modo de viver daqueles que habitaram aquele espaço que se insere em uma sociedade específica [2]. Nos museus-casa, esse conjunto de objetos pode "oferecer uma visão muito mais complexa de seu passado através de múltiplas camadas e múltiplas experiências sensoriais que expandem as escolhas interpretativas e [criam] conexões" [8].

A visão panorâmica de um outro tempo e espaço que são apresentados na escala do indivíduo, obviamente, não é construída nos museus-casa apenas por tecidos decorativos. São inúmeras as classes de objetos que encontravam-se nas casas urbanas burguesas finisseculares, momento no qual, na cultura ocidental, a decoração doméstica tornou-se uma exigência de socialização que comprovava a prosperidade econômica da família [9]. Entretanto, naquelas casas os tecidos tiveram importância destacada, sobretudo porque representavam um dos maiores avanços tecnológicos com impacto na vida doméstica: isso significou uma enorme diversificação de produtos, acessibilidade a tecidos antes considerados luxuosos, pluralidade de estilos, barateamento e ampliação de consumo etc., o que deu aos tecidos novas conotações simbólicas.

Cada um desses aspectos reflete os valores das sociedades urbanas europeias (e as eurofiliadas, como era o caso do Brasil) na passagem do século XIX para o XX. Esses valores não se limitam ao design, à moda, à decoração ou até mesmo ao gosto; referem-se também à relevância que as tecnologias, saúde, tendências estéticas, papeis dos gêneros, mudanças paradigmáticas nas artes, estratificação social, entre outras questões, adquiriam em cada contexto. Assim, entende-se, os têxteis decorativos abrem portas para a análise de diferentes dimensões da vida social dos indivíduos.

Obviamente, os demais objetos decorativos são muito importantes para a configuração dos espaços, mas os tecidos podem ser considerados uma das espécies materiais mais próximas do indivíduo e do tempo, pois personalizam e humanizam os ambientes [10]. Com relação à sua relevância para a museografia, deve-se considerar que se os "têxteis dos ambientes domésticos do passado foram investidos com sentido [...] é importante preservar a relação entre os interiores históricos e seus componentes têxteis"; os têxteis são "um meio para compreender os sentidos que os interiores tinham para seus habitantes" [11].

Com o passar dos anos, como demonstram os registros fotográficos do Museu Casa de Rui Barbosa, os móveis e elementos decorativos construtivos mantiveram-se na casa de Rui Barbosa, enquanto os têxteis – cortinas, tapetes, estofamentos e outros – foram constantemente renovados: em seu dinamismo, acompanharam mudanças da sociedade e a trajetória dos indivíduos. Desafortunadamente, essa mesma volatilidade prejudica o seu estudo, uma vez que dentro das casas (e também nos museus), os têxteis estão entre as espécies mais vulneráveis à degradação e em virtude de sua rotatividade, expõem-se à descaracterização.

As condições descritas deram início ao entendimento de que os têxteis seriam imprescindíveis para a narrativa museográfica do Museu Casa de Rui Barbosa. Estando clara a diferença existente entre a condição dos ambientes no período da pesquisa (2010-2012) e o período de referência (1895-1923), a reintrodução de artefatos têxteis no museu-casa passou a ser tema de reflexão. A intenção do Projeto era o de renovar os têxteis de modo que os novos artefatos contivessem o mesmo valor informacional dos tecidos originais nos diferentes espaços. Desse desafio, desenvolve-se o debate teórico a seguir apresentado, no qual pontuam-se algumas justificativas para o uso de artefatos têxteis não-originais nos museus-casa na perspectiva de sua finalidade museográfica. Lembro, apenas, que todas as considerações surgiram a partir da pesquisa realizada que, em certa medida, é circunscrita ao Museu Casa de Rui Barbosa especificamente e à condição brasileira. Observando projetos similares em outros museus-casa europeus, pudemos notar que o Brasil tem um dificuldade adicional tanto para realizar a pesquisa quanto para providenciar os têxteis não-originais. Isso não é um fato secundário e, certamente, também condiciona esta reflexão.

Artefatos têxteis não-originais na museografia do Museu Casa de Rui Barbosa

O Projeto de Renovação Museográfica foi assumido como um *ato de criação* composto por um "processo de correções e adições" na museografia [12]. A identificação dos têxteis que teriam tomado parte do arranjo decorativo daquela casa partiu majoritariamente de registros fotográficos datados de 1923, mas também acessou outras fotografias e documentos desde 1895. Entendeu-se que esses 28 anos foram um período de acúmulo que poderia ser considerado pela museografia, isto é, a reintrodução dos têxteis não significaria reproduzir um preciso momento da vida daquela casa.

Sem dúvida, a casa atendia ao padrão decorativo europeu (inglês e francês em particular) da época, de modo que a identificação das tipologias têxteis não se pautou somente pelas fotografias ou descrições documentadas, mas, também, por fotografias de outras casas, de catálogos de lojas do período, por acervos de outros museus no Brasil, Áustria e Inglaterra, outros estudos, etc. Seguindo essas referências, foi proposto um arranjo de materiais com texturas, cores e padrões que está sintetizado no quadro de materiais e padrões (Figura 2), atendendo tanto à pesquisa histórica quanto à museografia, no sentido de que em cada cômodo há o domínio de uma materialidade, o que auxilia no momento da visitação. Procurou-se determinar a saturação dos espaços e a composição visual de cada ambiente segundo sua função prática e simbólica, de modo a alcançar uma decoração plausível para a casa, sugerindo um arranjo decorativo que refletisse a personalidade intelectual dos proprietários e estivesse alinhada com o padrão estético da época. A ideia geral, portanto, foi a de identificar tipologias que poderiam ter tomado parte daquela decoração e não necessariamente identificar cada um dos têxteis de modo preciso.

Desde essa perspectiva, o principal temor da equipe de museólogos foi o do falso histórico; temia-se que, por meio da reincorporação de artefatos têxteis ao museu-casa, se construíssem ambientes cenográficos representativos de fantasias contemporâneas sobre o passado. A intenção do Projeto, que era o de introduzir têxteis que comunicassem o contexto histórico de referência – um Brasil urbano finissecular que apreciava a modernidade europeia e entendia que o progresso material era também civilizador –, estimulou o debate ético e prático sobre a questão dos têxteis não-originais no museu-casa e sua função na museografia. Sabia-se que, intermediada pela presença de têxteis não-originais, se estabeleceria uma nova relação fenomenológica entre os visitantes e a história que a casa conta.

Estabelecer a função museográfica dos artefatos não-originais dentro do Museu Casa, foi o primeiro obstáculo encontrado, pois a inautenticidade dos objetos não poderia mais garantir a conexão com o processo histórico específico [13] que se explora no museu-casa. Entretanto, ao relacionar-se com sua materialidade, os sentimentos evocados pelo o uso, função, tradições, linguagem, espírito e sentimento dos objetos, abrem portas para pensar que artefatos não-originais também possam ser considerados autênticos do ponto de vista histórico [14]. No processo de renovação museográfica os artefatos não-originais perderiam sua dimensão documental, mas sua dimensão informacional permaneceria a mesma.

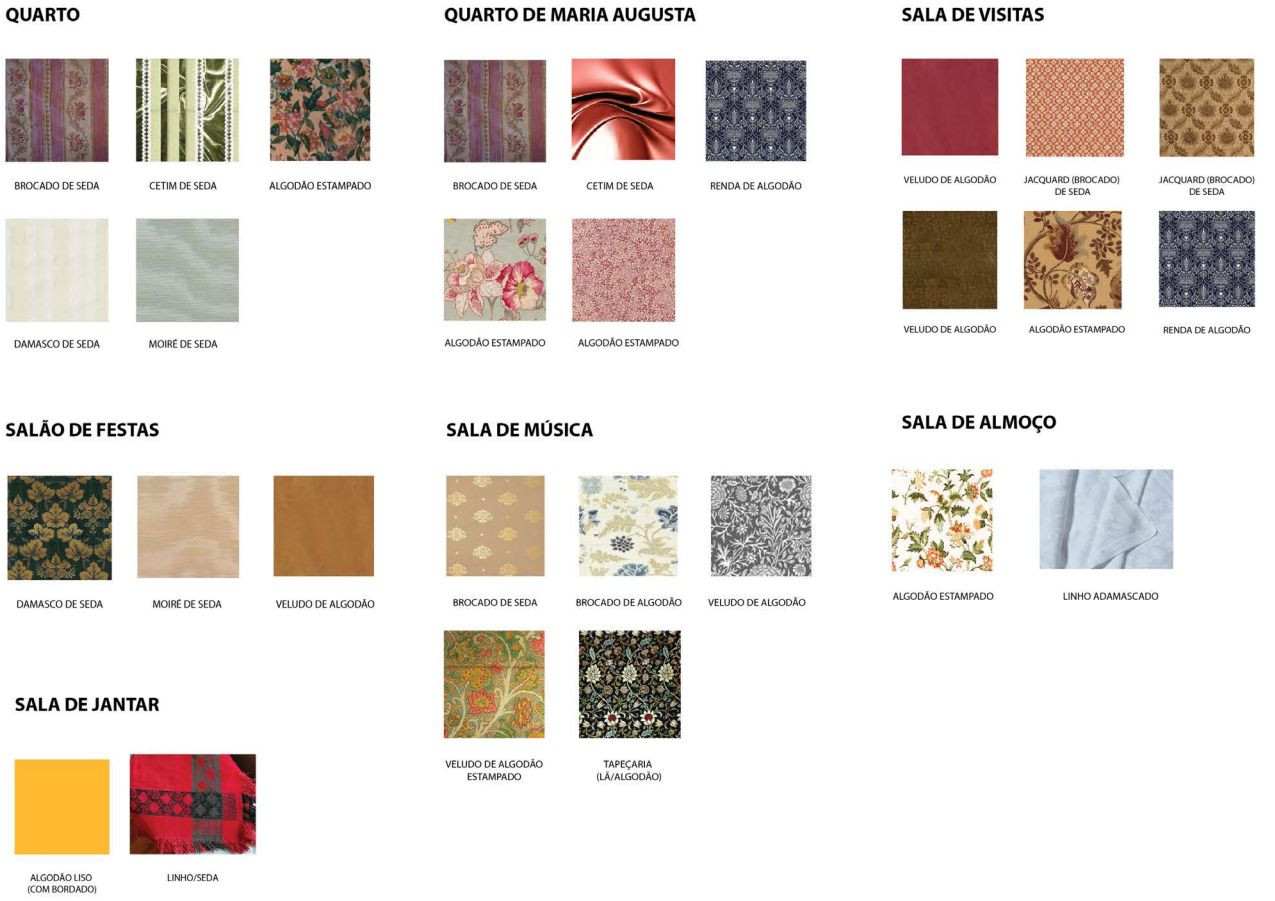


Figura 2. Painel de tecidos que apresenta a saturação dos ambientes segundo seu uso e função social. É uma proposta para a museografia que pensa os espaços como ambientes didáticos. Esses tecidos, cores, texturas e materiais, podem ajudar a compreender a vida daquele período em muitas dimensões.

Assim, definir formas de manter a autenticidade na narrativa museográfica, supõe estabelecer novas relações entre o visitante, o suposto original e o não-original. A mediação entre indivíduo e história que se faz por meio da narrativa sobre um artefato autêntico, deve tentar ser reproduzida na mediação entre um artefato autêntico e o não-autêntico. As características formais fundamentais aos artefatos têxteis não-originais deve ser o objeto de nova reflexão.

Existem diversos estudos que se dedicam ao tema e a maioria deles relembra que a percepção do observador-visitante recai sobre a identidade efetiva do artefato que é definida pela relação entre estrutura e função primária originais [2]. Isso quer dizer que, dentro de um certo limite, a estrutura do artefato têxtil não-original em seus atributos estéticos e materiais deve adequar-se à mesma função prática de origem. No caso dos têxteis decorativos, as funções práticas (seu uso como cortinas, estofados, colchas, almofadas, panos decorativos, etc.) devem ser condizentes com os ambientes, preservando a estrutura formal original no artefato não-original.

A fidelidade dessa relação considera que os novos artefatos utilizam-se da mesma identidade estrutural (mesmo aspecto visual) e/ou funcional (mesma finalidade) [15]. Assim, por exemplo, é possível preservar a identidade efetiva utilizando visualidades idênticas, similares ou, simplesmente, diferentes. Pode-se supor, a título de exemplo, que ainda que se introduza uma cortina cuja cor e padrão ou até mesmo modelo específico jamais existiram na casa, desde que ela mantenha sua mesma identidade efetiva e que seja condizente com o contexto, cumprirá suas funções educativas na narrativa museográfica, exercendo seu papel como objeto de conhecimento. Isso quer dizer que não tendo sido possível localizar, definir ou até mesmo reproduzir na atualidade todas as características físicas de um artefato têxtil específico, não seria eticamente incorreto lançar mão de um substituto: um artefato com a mesma finalidade, com forma e aparência condizente com o contexto histórico de referência e que, ainda, tivesse a performance de uso equivalente ao seu original. Por performance de material entende-se o sua plasticidade, opacidade, densidade, etc., que, coloquialmente é nomeado como *caimento do tecido*.

Ocorre que nos têxteis essas possibilidades tornam-se extremamente complexas no desempenho de sua função museográfica dentro de um museu-casa. Lembrando que enquanto objetos de conhecimento os têxteis decorativos finisseculares deveriam expressar vários conceitos – tecnologia, higiene, gênero, estética e outros –, nem sua estrutura, nem sua função, por si mesmas, atendem plenamente à intenção museográfica dentro do projeto de renovação proposto. Obviamente, se o objetivo da visitação no Museu Casa de Rui Barbosa estivesse limitado à percepção sensorial do espaço doméstico se poderia concluir pela sua efetividade. Entretanto, neste caso específico, a visualidade, materialidade e tecnologias de produção disponíveis à época de Rui Barbosa associam-se ao conhecimento histórico que se pretende extrair deles na narrativa museográfica.

Sobre a primeira questão – a visualidade –, embora não fosse possível definir com clareza quais eram os padrões e cores específicos dos tecidos que um dia decoraram a casa, um conceito geral que atendesse ao padrão decorativo do período pôde ser proposto. O acesso aos registros fotográficos existentes somados a alguns fragmentos dos arquivos, ao acervo e, também, a materiais de referência do período, permitiram sugerir padrões cromáticos e decorativos para cada um dos ambientes. Do ponto de vista técnico, dada a condição tecnológica atual, não haveria dificuldades em reproduzir os ornamentos sugeridos pela pesquisa, isto é, a visualidade da casa.

Com respeito à materialidade, se sabe com bastante fidelidade quais eram as matérias-primas existentes no período e de que forma eram utilizadas, mas pouco se sabe sobre seu uso na casa de Rui Barbosa embora seja possível deduzir. Essa questão foi relevante, pois suscitou a dúvida se a materialidade dos artefatos não-originais deveria ou não se limitar às matérias-primas típicas do período (seda, lã e algodão), pois elas interferem no caimento, peso, brilho, textura, etc. dos tecidos, mesmo sabendo que novos materiais possam reproduzi-los.

Como último e mais complexo ponto, tem-se a questão da técnica de produção dos têxteis. A pesquisa definiu-os em três categorias distintas: têxteis industriais eram aqueles produzidos pelas indústrias europeias do período, como brocados, damascos, veludos, etc.; têxteis artesanais compunham o conjunto de têxteis normalmente produzidos pelas mulheres da casa e que se refletiam em bordados, rendas e demais trabalhos de agulha; têxteis artísticos, aqueles aos quais se associava alguma origem criativa ou técnica em especial e, normalmente, valorizados por serem únicos ou quase únicos, como tapetes ou tapeçarias que, naquela época, significavam símbolo de status indiscutível uma vez que a produção industrial dessas espécies fazia com que esses artefatos se tornassem mais acessíveis. A questão que surgiu desse ponto, assim, foi sobre a necessidade de se produzir não-originais a partir das mesmas tecnologias ou técnicas que se adequavam ao período, ou se seria necessário adquirir peças únicas como aquelas que estavam originalmente na casa.

O Museu Casa de Rui Barbosa não foi o primeiro museu-casa a enfrentar esses dilemas, de modo que a consulta a estudos prévios permite notar que existe uma tentativa de estimar o alcance e as limitações dos processos de renovação museográfica. Algumas categorias já estabelecidas procuram estimar o grau de proximidade ou distanciamento entre têxteis não-originais e originais: uma cópia ou reprodução preserva a estrutura e função dos artefatos originais e ainda são produzidos com as técnicas originais; uma réplica, por sua vez, também é idêntica ao original, mas foi produzido por técnicas e materiais modernos; um substituto, por fim, é quando um tecido é reproduzido por outro meio ou materialidade, como por exemplo por sua fotografia ou meios digitais diversificados. Além dessas possibilidades, um dos pontos-de-vista resultantes dessa pesquisa conduziu para a proposta de renovar objetos originais por outros equivalentes e pertinentes, mas não

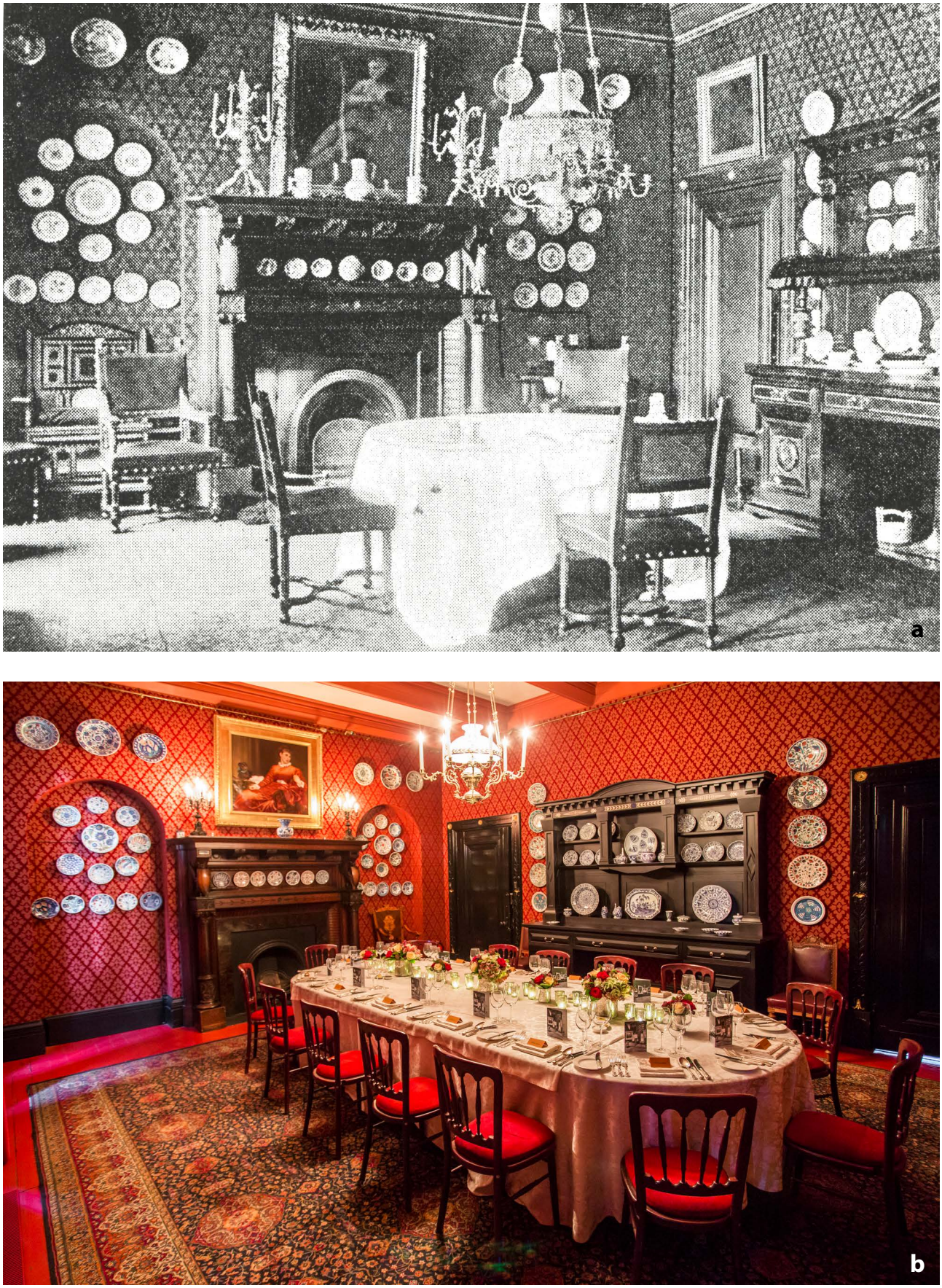


Figura 3. Apresentação do projeto executado pelo Leighton Museum. Apesar de os ambientes serem novos, eles contêm informação histórica para o público da casa. Trata-se de um exemplo de referência que foi considerado durante a pesquisa para o Museu Casa de Rui Barbosa. Fonte: The Royal Borough of Kensington and Chelsea.

necessariamente iguais em termos estéticos ou materiais. Por exemplo, pode-se substituir uma toalha de renda de bilro por outra de labirinto, uma vez que ambas são possibilidades equivalentes, espécies pertinentes ao mesmo tempo-espaço.

Todo esse conjunto de possibilidades, por fim, demonstra que mais relevante do que estabelecer critérios mínimos de similaridade podem ser estabelecidas pelos objetivos e desafios museográficos. Esse mesmo entendimento é compartilhado nas ações desenvolvidas em museus britânicos:

> Enquanto o museu possui uma importante coleção do trabalho (de arte) de Leighton, a maioria daquilo que a envolve é replicado, reproduzido ou aproximado: objetos de períodos próximos apresentam-se no lugar de artefatos e móveis originais; outros são cópias modernas. Destaca-se entre esses uma impressionante réplica da escrivaninha projetada por Aitchison para Leighton, mas até agora conhecida somente por uma fotografia reticulada; e talvez cópias mais contenciosas *do Four Times of Day*, de Corot, pendurados proeminentemente no lugar dos originais que estão na National Gallery. Então, enquanto a renovação (museográfica) é descrita no catálogo como uma *restauração*, ela pode ser mais apropriadamente nomeada como uma reconstrução, dado que a maioria de seus detalhes são aproximações modernas [12].

Os elementos não-originais que podem ser identificados na comparação entre as fotografias de referência histórica da Leighton House (Figura 3) e de sua atual condição, no entendimento dos curadores da instituição, "ajudam a comunicar o *caráter decorativo* original da casa, sem os quais, *somente metade da história* poderia ser contada" [12]. Resumidamente, a inserção dos não-originais possibilita potencializar a museografia, não porque a torna atraente ou cenográfica, mas porque, acredita-se, em se tratando de museus-casa, os espaços (cômodos, ambientes, áreas) seriam "cuidadosamente calibrados para realçar a auto-imagem da identidade profissional, implícita ou explicitamente sustentada por motivações pecuniárias" [12].

Como pode ser visto a partir da comparação entre as imagens do final do século XIX e as atuais (sem datação precisa), o processo de renovação dos ambientes buscou uma grande aproximação estética com os ambientes originais, ainda que se notem diferenças. Segundo os materiais de divulgação consultados, houve preocupação em produzir os tecidos com as mesmas técnicas e materiais que seriam próprios daquele período, a fim de garantir fidelidade histórica à museografia. Esse ponto pode ser um indicativo de que a preservação das técnicas por meio de sua reutilização pode ser um valor importante para a consolidação do sentido de originalidade material nos contextos nos quais ela inevitavelmente será perdida.

Considerações finais

> A tentativa de recriar um interior histórico inevitavelmente porta a dificuldade da autenticidade, a qual se intensifica quando consideramos a experiência dos visitantes nesses ambientes. Evidentemente, ter somente objetos originais seria ideal; como Kevin Moore afirma, "o real é geralmente mais efetivo que suas reconstruções comparáveis" e nós "os admiramos por sua antiguidade e aura" [16].

A reintrodução de têxteis no Museu Casa de Rui Barbosa estaria fundamentada em sua capacidade de comunicar relações históricas aos seus visitantes, sempre que atravessadas pela figura do patrono da casa, Rui Barbosa e sua família. Assim, as características dos novos têxteis deveriam permitir acessar aquele tempo-espaço preciso sem que sua não-originalidade fosse mascarada. A originalidade material – no sentido de que precisamente aquele artefato foi parte daquele cenário – poderia ser considerada menos importante para a dimensão educativa do museu-casa, embora seja socialmente extremamente valorizada. Por outro lado, ainda assim a autenticidade histórica poderia ser alcançada.

Mas para o conhecedor da materialidade têxtil as características físicas específicas dos têxteis comportam sentidos inegociáveis. Sua materialidade, nela incluída a técnica que lhe deu origem, o padrão, a superfície, o volume, etc., são detentores de significados simbólicos que, dificilmente, são obtidos por artefatos substancialmente diferentes. Isso torna-se um grande problema para os museus, pois, pelo menos no contexto brasileiro, a dificuldade de obter tecidos que atendam a todas as demandas do Projeto é um obstáculo intransponível dadas as características que a pesquisa indicou como sendo pertencentes aos originais.

Considerando os estudos precedentes e as reflexões contemporâneas que confrontam os princípios científicos da museologia com aquilo que é interesse do público não especializado, é inegável que as expectativas são divergentes. Contudo, uma vez que o espaço expositivo do museu é apenas uma das faces da instituição e, que de todo modo, sua função educativa é tornar inteligível um determinado conhecimento, a originalidade dos artefatos, das técnicas ou dos materiais poderia ser um rigor excessivo. Assim, estudar tecnicamente meios de reproduzir as sensações espaciais, táteis e visuais do período de referência poderia ser um importante avanço do ponto de vista museográfico. Inclusive porque, como se sabe, qualquer projeto de renovação de têxteis também tem uma vida útil curta, uma vez que os têxteis se deterioram velozmente. Desde este ponto de vista, deve-se desenvolver estratégias didáticas para facilitar ao visitante não só a informação histórica contextual, mas também a pesquisa e a renovação como objeto da própria museografia.

Agradecimentos

A pesquisa foi financiada pela Fundação Casa de Rui Barbosa, que é uma instituição federal brasileira e que pertence ao Ministério da Cultura do Brasil. No período 2010-2012, a autora do artigo foi bolsista da instituição.

ORCID

Luz Neira García
https://orcid.org/0000-0002-3620-4238

Referências

1 Halvorson, B., 'Modern replacement fabrics in historic interiors: ethical and practical concerns', in *The conservation of Heritage Interiors: Preprints of a Conference Symposium 2000*, Canadian Conservation Institute, Ottawa (2000) 107-112.

2 Van Mensch, P., 'Methodological museology; or, towards a theory of museum practice', in *Objects of Knowledge*, ed. S. Pearce, The Atholone Press, London (1990) 141-157.

3 Forty, A., *Objetos de Desejo*, Cosac Naify, São Paulo (2007).

4 Jordanova, L., 'Objects of knowledge: a historical perspective on museums', in *The New Museology*, ed. P. Vergo, Reaktio Books Ltd., London (2000) 22-40.

5 Jones, S., 'Negotiating authentic objects and authentic selves', *Journal of Material Culture* **15**(2) (2010) 181-203, https://doi.org/10.1177/1359183510364074.

6 Van Mensch, P. 'Towards a methodology of museology', tese de doutoramento, University of Zagreb, Zagreb (1992).

7 Porter, J.; MacDonald, S., 'Fabricating interiors: approaches to the history of domestic furnishing at the Geffrye Museum', *Journal of Design History* **3**(2-3) (1990) 175-182, https://doi.org/10.1093/jdh/3.2-3.175.

8 Donelly, J. F., *Interpreting Historic House Museum*, Altamira Press, Walnut Creek (2002).

9 Ferry, K., *The Victorian Home*, Shire, Oxford (2010).

10 Schoeser, M., *Fabrics and Wallpaper Twentieth-Century Design*, E. P. Dutton, New York (1986).

11 Ponsonby, M., *Faded and Threadbare Historic Textiles and Their Role in Houses Open to the Public*, Routledge, London and New York (2016).

12 Droth, M., 'Leighton's House: art in and beyond the studio', *Journal of Design History* **24**(4) (2011) 339-358, https://doi.org/10.1093/jdh/epr038.

13 Maines, R.; Glynn, J., 'Numinous objects', *The Public Historian* **15**(1) (1993) 9-25, https://doi.org/10.2307/3378030.

14 Jerome, P., 'An introduction to authenticity in preservation', *APT Bulletin* **39**(2-3) (2008) 3-7.

15 Gluzinski, W. W., 'Originals versus substitutes', in *Symposium Originals and Substitutes in Museums*, ICOM, Zagreb (1985) 41-47.

16 Graham, E., 'History at home: Leighton House, Sambourne House, and the Heritage debate', Grinnell-in-London Internship, Professors Strauber and Vinter (2008).

Recebido: 2018-6-16
Revisto: 2018-10-22
Aceite: 2018-12-11
Online: 2019-2-14

Estudos sobre têxteis históricos
Studies in historical textiles
A. Serrano, M. J. Ferreira, E. C. de Groot (ed.)

Nota / Note

Um espelho *stumpwork* na coleção da Casa-Museu Medeiros e Almeida – análise descritiva e iconográfica

Maria de Lima Mayer

Casa-Museu da Fundação Medeiros e Almeida, Rua Rosa Araújo, 41, 1250-194 Lisboa, Portugal
maria.mayer@casa-museumedeirosealmeida.pt

Resumo

Este texto pretende analisar uma peça da coleção de têxteis do acervo da Casa-Museu Medeiros e Almeida. Trata-se de um espelho de parede de produção inglesa, com uma moldura de bordado, realizado no terceiro quartel do século XVII, cuja decoração inclui a representação do rei Carlos II de Inglaterra e da rainha Catarina de Bragança. A originalidade da peça está no tipo de trabalho de agulha, chamado *stumpwork*, que resulta da combinação de bordado direto com bordado aplicado sobre enchimento, criando um efeito de relevo. Produzido com uma grande variedade de pontos de agulha e materiais, o *stumpwork* produziu-se sensivelmente durante a centúria de seiscentos. De modo a compreender e contextualizar a obra, são analisadas vertentes como a época e as razões pelas quais surgiu este curioso trabalho de agulha, as técnicas, os materiais empregues, as temáticas abordadas e as respetivas fontes iconográficas.

Palavras-chave
Espelho
Bordado
Stumpwork
Século XVII
Carlos II
Catarina de Bragança

A stumpwork mirror in the collection of the Medeiros e Almeida House-Museum – descriptive and iconographical analyses

Abstract

The aim of this paper is to analyze a work of art belonging to the collection of textiles of the Medeiros e Almeida House-Museum collection. It is a wall mirror of English production, with an embroidery frame, made in the third quarter of the 17th century, whose decoration includes a depiction of King Charles II and Queen Catherine of Braganza. The originality of this piece consists in the type of needlework, called stumpwork, that it is the result of the combination of both direct and applied embroidery on pads, creating a relief effect. Produced with a wide variety of techniques and materials, the stumpwork was produced during the 17th century. In order to understand and contextualize the work of art, aspects such as the period and the reasons that gave birth to this curious kind of work, the techniques and materials used, the themes addressed and the respective iconographic sources were approached.

Keywords
Mirror
Embroidery
Stumpwork
17th Century
Charles II
Catherine of Braganza

ISSN 2182-9942

Conservar Património **31** (2019) 177-190 | https://doi.org/10.14568/cp2018028
ARP - Associação Profissional de Conservadores-Restauradores de Portugal
http://revista.arp.org.pt

A Casa-Museu Medeiros e Almeida possui no seu acervo, integrado na coleção de têxteis, um espelho de parede, inglês, do século XVII, cuja moldura, de estrutura em tartaruga, é decorada com um tipo de bordado típico da época, conhecido como *stumpwork*, com a representação do casal real Carlos II e Catarina de Bragança em relevo; é exemplar único nas coleções públicas portuguesas (Figura 1).

De modo a podermos contextualizar a análise da obra, importa fazer uma breve introdução ao trabalho de *stumpwork*, uma produção que se limitou ao Reino Unido (dentro das suas especificidades) e a parte do século XVII, pelo que os exemplares existentes são testemunhos muito datados de uma produção exclusiva de um país e de uma época.

Figura 1. Espelho inglês, bordado em stumpwork, séc. XVII. Fotografia: Arquivo da Casa-Museu Medeiros e Almeida, Lisboa.

O *stumpwork*

Stumpwork é um tipo de bordado executado sobre suporte de cetim de seda ou linho cru que se carateriza pela utilização de vários pontos de agulha, como o *petit point*, ponto de ouro, ponto lançado, ponto de cadeia, ponto a cheio, ponto Gobelins e ponto de Bolonha (bordado direto), combinados com aplicações de fios e lâminas de metal (que funcionam como se de outro tipo de fios se tratassem), assim como pela aplicação de têxteis como veludo, cetim, brocado, froco, renda, elementos de passamanaria como franjas e galões e ainda materiais como pérolas, coral, contas de vidro, lantejoulas, canutilhos, espelhos, micas, pedaços de minerais, penas, metal, etc., compondo os elementos decorativos [1].

Neste trabalho de agulha, para além de elementos em bordado tradicional feitos diretamente no suporte, criam-se elementos figurativos – personagens, arquiteturas, fauna e flora – com recurso a diferentes tipos de bordados aliados a outros materiais, que são aplicados sobre enchimento de arame, cartão, madeira, feltro ou algodão e posteriormente cosidos sobre o suporte, criando uma decoração em relevo. Em geral, o fundo das composições é preenchido com pequenos elementos decorativos – flores, frutos, animais, insetos – num quase *horror vacui,* que confere cor e animação, se bem que igualmente alguma ingenuidade compositiva às peças. A falta de perspetiva e de escala são igualmente caraterísticas desta tipologia, na qual uma lagarta ou borboleta podem ter o tamanho de uma casa ou personagem.

A decoração deste tipo de trabalhos era desenhada pelas próprias bordadeiras – na produção de caráter mais doméstico – ou os tecidos de suporte eram adquiridos com os motivos previamente pintados, sendo que estes eram copiados ou inspirados em estampas coevas. Na maioria dos casos, há uma temática central e representações secundárias que não são necessariamente interrelacionadas. Estes eram, portanto, desenhos padronizados, sendo que a gramática decorativa se repetia com frequência, representando figuras alegóricas, personificações bíblicas e mitológicas ou, na falta de suporte iconográfico, simplesmente personagens.

Os elementos tridimensionais que emprestam grande originalidade a este tipo de composições deram origem ao nome do bordado, mencionado na bibliografia coeva como: *raised work, embossed work*, *padded work* ou ainda com o termo derivado do francês *brodees en relief*. A designação *stumpwork* foi somente atribuída pela historiografia vitoriana em meados ou finais do século XIX, não sendo clara, como referem alguns dicionários da especialidade, a sua origem: "Stumpwork may relate to the foundation used, thus embroidering on the stump" [2]. O termo poderá, portanto, aludir aos pedaços de madeira – cotos – utilizados na produção deste trabalho (*stumps*). A enciclopédia de técnicas de bordado Batsford (1984) é citada num texto que refere:

> Stumpwork: […] Favorite work in the 17th century when it was called: raised or embossed work, but later it became known as embroidery on the stamp and later still (19th century) stump work, though why is unclear [3].

Outras fontes remetem para o pedaço de tronco que é deixado no solo, criando um relevo, quando se corta uma árvore – o toco –, que em inglês se traduz por *stump*, ou, ainda, para a corruptela do termo inglês *stamp*, aludindo aos carimbos utilizados na estampagem dos modelos comerciais.

A origem – contextualização histórica do bordado

Esta técnica teve origem nos têxteis eclesiásticos dos séculos XV e XVI, cujo trabalho de agulha envolvia grande diversidade de técnicas e de materiais. Porém, a partir da criação da Igreja de Inglaterra no 2.º quartel do século XVI pelo rei Henrique VIII, o interesse divergiu para os bordados profanos, tanto ao nível do vestuário como da decoração doméstica, devido ao desaparecimento do cerimonial religioso. É nos reinados seguintes, com o auge no de Isabel I (1558-1603), que o bordado civil se torna moda. Caraterizando-se pela enorme complexidade e riqueza, nesta época já demonstrava alguma tendência para o relevo tendo, ficando eternizados em diversos retratos reais os magníficos trajes da rainha, ricamente bordados.

Segundo os historiadores do bordado, o *stumpwork* é um herdeiro direto dos bordados da era elisabetiana. Teve origem na época Stuart, provavelmente durante o reinado de Carlos I (1600-1649) no final do primeiro quartel do século XVII, e esteve em voga até finais do século. A maioria dos exemplares existentes data, porém, dos reinados pós-restauração da monarquia em 1660, devido ao patrocínio das artes, em geral, que se verificou na corte de Carlos II (1660-1685), após os anos de austeridade do Protetorado de Oliver Cromwell (1653-1659) [4].

As técnicas e os materiais não eram novidade pois já eram, há muito, utilizados nos bordados ingleses. Porém, o *stumpwork* levou a criatividade e fantasia ao limite. Os trabalhos desta época destacam-se pela sua expressividade neles surgindo combinações sofisticadas de fios de seda com diferentes cores em combinações com fios (fios de fieira, chamado neste âmbito filé) e lâminas de metal que criam efeitos e tonalidades que potenciam a leitura cromática e táctil das peças.

O Reino Unido tinha até então uma longa tradição no bordado, praticado tanto por mulheres como por homens, sendo que, em 1561, existia inclusivamente uma corporação de bordadores profissionais, a *Worshipful Company of Broderes*, na qual não podiam entrar mulheres. O *stumpwork*, enquanto passatempo, era, porém, realizado exclusivamente por mulheres que começavam desde meninas, já que os trabalhos de agulha faziam parte da sua educação. Dependendo do estatuto socioeconómico, as meninas das classes mais baixas encarregavam-se de trabalhos, como o seu próprio vestuário e outras necessidades para o lar, e as meninas

de classe média e nobres aprendiam mais pontos e faziam peças mais elaboradas como forma de preparação para o seu papel de futuras esposas e donas de casa, entre as quais, o *stumpwork*. Maioritariamente os trabalhos denunciam o estatuto socioeconómico da sua autora, tanto pelas tipologias dos objetos, como pela escolha das temáticas, por vezes, carregadas de mensagens sociais, religiosas e políticas, assim como pela utilização de materiais, de melhor ou pior qualidade e variedade. Alguns trabalhos eram assinados ou marcados com iniciais – existe um cofre assinado e datado de 1671 por Martha Edlin (1660-1725), uma menina com 11 anos, no Victoria & Albert Museum de Londres (n.º inv. T.432-1990) [5].

Os tecidos utilizados como suporte do bordado, provenientes da Índia ou China, eram adquiridos com os desenhos preparatórios previamente pintados ou carimbados, deixando pouca criatividade ao bordador – existem ainda exemplares com áreas por bordar, identificando-se facilmente o desenho original e o processo de produção. No espelho da Casa-Museu notam-se, no rosto das personagens, vestígios dos traços condutores do desenho. A criatividade dava-se ao nível da execução do bordado e no tipo de pontos, cores e materiais aplicados.

Tendo a Companhia das Índias Orientais sido fundada em 1601, a conjuntura económica foi propícia para este tipo de trabalho, pois a seda, o ouro e a prata, bem como outros produtos de luxo, chegavam em abundância a Inglaterra através das viagens marítimas, principalmente a partir da Restauração da monarquia, quando a situação política acalmou e o comércio destes produtos já se encontrava totalmente estabelecido.

Com o passar do século, de uma certa ingenuidade e simplicidade das formas e decoração, as composições tornaram-se mais elaboradas e complexas e no último quartel do século XVII chegaram a criar-se exemplares tão exagerados que incluíam elementos tridimensionais feitos à parte e colocados a acompanhar as peças. É famoso um cofre das coleções reais inglesas que tem no seu topo toda uma composição com árvores e, sob uma delas, a figura de uma pastora sentada com ovelhas, um cordeiro e um cão (datado de 1660-1690, Royal Collection Trust, n.º inv. RCIN 39240). Foi o final do século que viu chegar o declínio deste tipo de trabalho, o que é explicado pelo exagero que se atingiu e que conduziu a uma viragem de gosto, como é habitual, para a simplicidade. A chegada em massa a Inglaterra dos têxteis indianos e orientais, enquanto novidade, contribuiu igualmente para o declínio do gosto por este tipo de bordado [6].

Devido ao curto período em que foi feito, o trabalho de *stumpwork* nunca passou de amador sendo, por isso, referido como uma atividade *doméstica* de cariz *naif*.

Atualmente existem acervos de peças com bordado *stumpwork* na coleção real inglesa (Royal Collection Trust), no Victoria & Albert Museum e no Bristish Museum, em Londres, no Ashmolean Museum, em Oxford, na Lady Lever Art Gallery, em Liverpool, no Holburne Museum, em Bath, e no Metropolitan Museum of Art de Nova Iorque.

As tipologias

Esta técnica decorativa foi aplicada a pequenas peças de mobiliário como molduras de espelhos, cofres, caixas e pequenos contadores (para guardar joias, cosméticos, aprestos de escrita, recordações e material de costura e bordado), bem como a peças de vestuário – luvas, cintos e bolsas – ou pequenos objetos do quotidiano como almofadas, capas de livro (nomeadamente sagrados), escovas, espelhos de mão, cestos e caixas de dimensão reduzida.

Outras tipologias curiosas são os *quadros* bordados que eram feitos para puro deleite visual – mais frequentes no início da produção, que se emolduravam e penduravam tal como se de uma pintura se tratasse – e os retratos miniatura, correspondentes a cópias de originais em pintura que eram passados para bordado e usados em medalhão.

Em relação aos espelhos, conhecem-se diversas tipologias entre os de parede, os de mesa (com pé/cavalete), de viagem (com estojo), com portas e emolduradas, com ou sem caixa de vidro. Na maioria das molduras de espelhos conhecidas verifica-se que a temática segue o mesmo padrão decorativo com um casal, colocado lado a lado, sempre elegantemente vestidos, inseridos em fundos de arquitetura, fauna e flora e acompanhados de outros personagens, pensando-se que se trataria de uma peça ligada às celebrações matrimoniais.

As temáticas / As fontes

No que diz respeito à linguagem decorativa desta tipologia, dois géneros de desenhos predominam: os baseados na fauna e flora e os figurativos. Os primeiros evoluem de um cariz maioritariamente ingénuo para cópias fiéis de livros científicos de fauna e flora, segundo um interesse que despertou aliado às viagens marítimas que trouxeram a curiosidade pelo exótico, pelos novos mundos.

As figurações mais comuns são cenas bíblicas do Velho Testamento que, apesar dos constrangimentos do Protestantismo, eram aceites pelo seu caráter educativo; temáticas mitológicas e alegorias sempre com os seus simbolismos associados; e as populares representações de casais incluindo os reais, coevos do trabalho. Realizam-se ainda algumas cenas historiadas, baseadas em factos históricos, sendo que os fundos eram preenchidos com as já mencionadas arquiteturas, elementos vegetalistas e animais, pássaros e insetos.

Dois tipos de fontes de inspiração surgem associados a este género de trabalho: o imaginário popular dava origem à gramática decorativa das peças realizadas em ambiente doméstico, mais humilde e sem referências. A produção mais erudita ia buscar inspiração às fontes impressas que circulavam à época, produzindo um tipo de decoração com diferentes níveis de leitura, cujos referentes remetiam para a história, religião, heráldica, mitologia, alegorias, fauna e flora. Em relação a estas fontes impressas, os motivos eram copiados de três fontes principais: álbuns de estampas, álbuns de padrões (inicialmente vindos do continente europeu mas que no século XVII já se editavam

no Reino Unido) e publicações científicas. Entre as obras de produção inglesa, onde já constavam as novidades exóticas do mundo animal e da botânica contam-se: *The Herball or Generall Historie of plantes*, de John Gerard (1597), *Insectorum Theatrum*, de Thomas Moffet (1634), ou *The History of Four-Footed Beasts and Serpents*, de Edward Topsell (1658) [7].

Análise da peça – descrição formal e iconográfica

Trata-se de um espelho de *toilette*, retangular, de lados levemente biselados, integrado em caixa alta envidraçada, de estrutura de madeira formando esquadria com oito painéis, ora quadrangulares, ora retangulares que enquadram o espelho ao centro. A esquadria é revestida a casca de tartaruga de perfil abaulado, aplicada sobre folha de ouro, o que acentua as tonalidades do manchado da tartaruga. Este revestimento apresenta algumas pequenas falhas e fraturas, não estruturais, consistentes com a utilização e idade da peça, considerando-se que a moldura seja coeva do trabalho de bordado. O fundo da moldura é revestido a cetim de seda marfim (geralmente este assenta, por sua vez, em tecido de algodão, embora tal facto não possa ser verificado na peça em análise), sendo trabalhado com bordado direto, com vários pontos

Figura 2. Carlos II (pormenor). Fotografia: Arquivo da Casa-Museu Medeiros e Almeida, Lisboa.

Figura 3. Catarina de Bragança (pormenor). Fotografia: Arquivo da Casa-Museu Medeiros e Almeida, Lisboa.

e materiais, e bordado de aplicação, este assente sobre pequenas camadas de enchimento de algodão, lã, cartão ou arame, num trabalho conjunto que cria um efeito de tridimensionalidade.

Na decoração bordada da moldura destacam-se duas figuras de corpo inteiro inseridas nos compartimentos laterais (centrais) do espelho, sob baldaquinos: à esquerda, uma masculina e, à direita, uma feminina, representadas envergando trajes de aparato: ele de casaca, gola de renda, meias altas e sapato de tacão alto e ela de vestido comprido, todo lavrado com flores e capa. Ambas as figuras estão coroadas e seguram um cetro (o da figura feminina caiu) sendo que a figura masculina ostenta, ainda, um globo na mão esquerda e traja capa de arminho com grande colar sobreposto.

O cuidado tratamento destas duas personagens permite a sua identificação iconográfica: trata-se de personagens reais, neste caso, das representações do rei Carlos II de Inglaterra e da sua mulher D. Catarina de Bragança. As insígnias reais como a coroa, a capa e o colar (podendo indicar a Ordem da Jarreteira) identificam o monarca, para além do vestuário típico do período da Restauração, das caraterísticas físicas, como a farta cabeleira encaracolada e escura, o bigode e a mosca (esta não tão

Figura 4. Flor (pormenor). Fotografia: Arquivo da Casa-Museu Medeiros e Almeida, Lisboa.

Figura 5. Flor (pormenor). Fotografia: Arquivo da Casa-Museu Medeiros e Almeida, Lisboa..

Figura 6. Flor (pormenor). Fotografia: Arquivo da Casa-Museu Medeiros e Almeida, Lisboa.

Figura 7. Flor (pormenor). Fotografia: Arquivo da Casa-Museu Medeiros e Almeida, Lisboa.

Figura 8. Reserva superior. figura masculina (pormenor). Fotografia: Arquivo da Casa-Museu Medeiros e Almeida, Lisboa.

frequente nas suas representações). A rainha reconhece-se pela coroa e cetro, pelas joias – na coroa, colar de pérolas e pregadeira – e principalmente pelo vestido com o cabeção e punhos de renda, pormenores imortalizados pelo retrato atribuído a Dirk Stoop, realizado em Lisboa em 1660-1661, por ocasião das negociações do casamento (*Catherine of Braganza*, atualmente exposto na National Portrait Gallery, de Londres, NPG 2563) (Figuras 2-3).

Os cantos da moldura dividem-se em quatro painéis quadrados apresentando um pé com diversas flores, entre as quais se destaca uma maior, e folhagem variada. Entre as diferentes espécies, identifica-se uma rosa, a flor real inglesa, mas é difícil apontar um cardo entre as outras representações (normalmente fáceis de identificar), se bem que seja comum este também figurar enquanto emblema da Casa Real inglesa (Figuras 4-7). Por entre cores ainda muito vivas, distinguem-se, claramente, os diversos tipos de pontos, dos mais simples aos mais complicados, com fios simples, duplos e enrolados em metal, tornando cada elemento único.

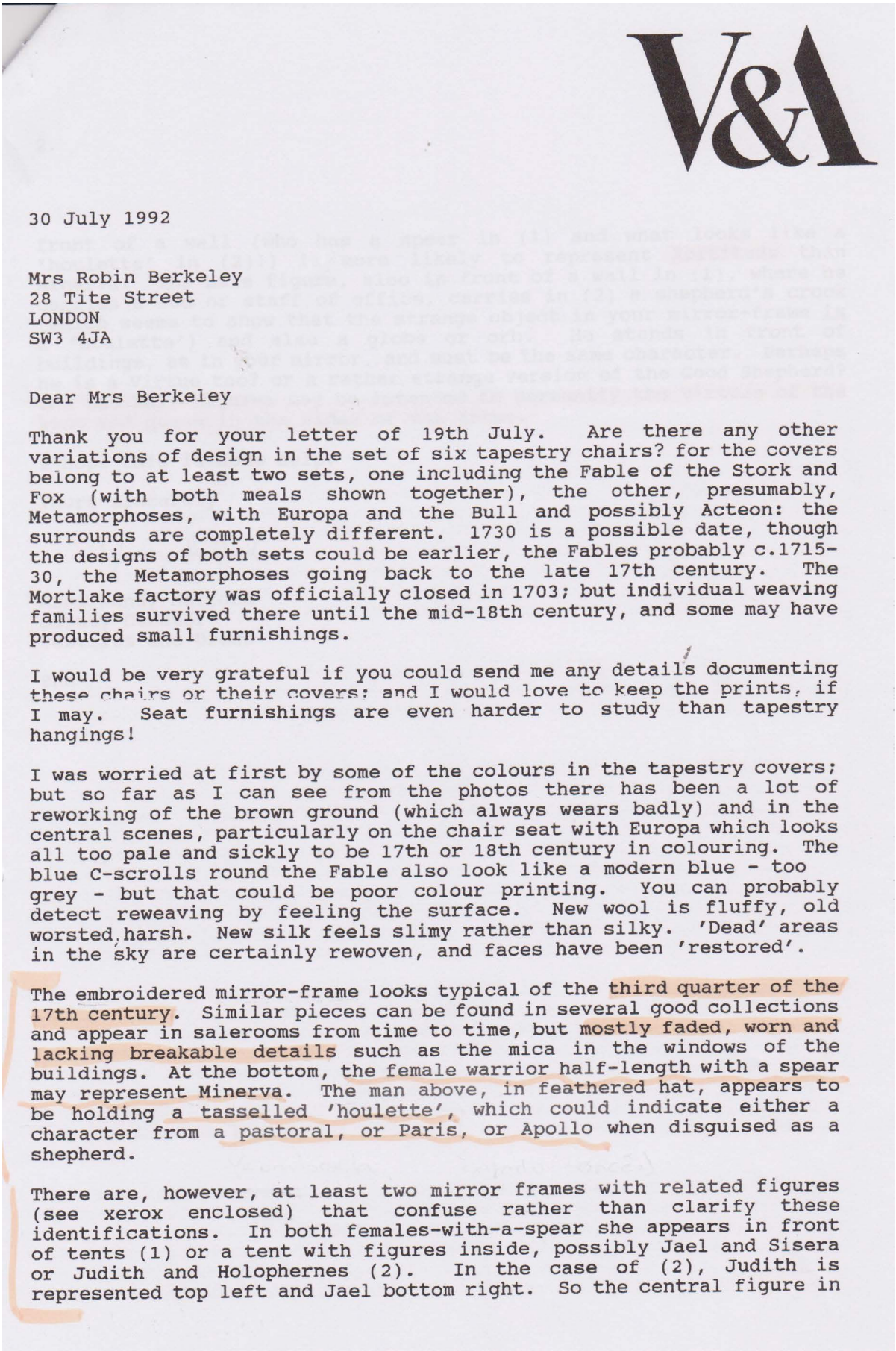
No topo da composição, ao centro, inserida em esquadria retangular, inscrita numa reserva oval definida por folho de renda aplicada, observa-se uma figura masculina de meio corpo representada em fundo com árvore e arquitetura palaciana (Figura 8). Embora tais arquiteturas surjam, por vezes, identificadas como sendo os castelos de Greenwich ou de Whitehall, neste caso pode tratar-se de uma vista do Palácio de Whitehall, em Londres, local onde os referidos monarcas habitaram, identificando-se uma porta, hoje inexistente, a King Street Gateway, que foi demolida em 1723 para alargar a passagem (identificável com algumas reservas, em estampas coevas, pelas cúpulas em semicírculo dos dois torreões, como em *King Street Gate Westminster / Vetusta Monumenta*, de G., Vertue, 1725). O mais certo, porém, é tratar-se de uma qualquer arquitetura palaciana, sem qualquer tipo de identificação possível, para além da indicação de cariz socioeconómico.

A reserva está ladeada por dois pássaros de aparência exótica, pousados em ramos com folhagem diversa e por dois pequenos lagos com peixes, bordejados por rochedos.

No compartimento inferior da composição, ao centro, abre-se uma reserva oval delimitada por um folho de fino acordoado aplicado, onde se representa uma figura feminina a meio corpo em fundo de paisagem na qual surge igualmente uma arquitetura palaciana e uma árvore. A figura de meio corpo enverga ricos trajes bordados com capa, ao pescoço usa um colar de contas, segura uma lança com borla e usa um toucado com penas (Figura 9).

À semelhança da reserva superior, esta figura aparece com ligeiras variações noutros exemplares, sendo interpretada como uma dama de corte ou diversas personagens, conforme a iconografia associada – como é o caso de uma alegoria à Vitória (segurando uma palma), às quatro estações (com flores no cabelo e acompanhada de outras três figuras femininas), aos cinco sentidos (a comer ou a cheirar quando acompanhada de outras quatro) ou representando figuras bíblicas como Dalila, Judite, ou Jael, que, nestes casos, se apresentam sobre fundos com tendas. É o caso de um exemplar de que se guarda registo documental na Casa-Museu, no qual surgem sensivelmente as mesmas personagens, masculina e feminina, ambas interpretadas enquanto Dalila e Jael, personagens bíblicas femininas, uma delas com a tenda em fundo (Figura 10).

No caso deste espelho, a peça foi brevemente analisada, por foto, em 1992, por Wendy Hefford, conservadora de



30 July 1992

Mrs Robin Berkeley
28 Tite Street
LONDON
SW3 4JA

Dear Mrs Berkeley

Thank you for your letter of 19th July. Are there any other variations of design in the set of six tapestry chairs? for the covers belong to at least two sets, one including the Fable of the Stork and Fox (with both meals shown together), the other, presumably, Metamorphoses, with Europa and the Bull and possibly Acteon: the surrounds are completely different. 1730 is a possible date, though the designs of both sets could be earlier, the Fables probably c.1715-30, the Metamorphoses going back to the late 17th century. The Mortlake factory was officially closed in 1703; but individual weaving families survived there until the mid-18th century, and some may have produced small furnishings.

I would be very grateful if you could send me any details documenting these chairs or their covers: and I would love to keep the prints, if I may. Seat furnishings are even harder to study than tapestry hangings!

I was worried at first by some of the colours in the tapestry covers; but so far as I can see from the photos there has been a lot of reworking of the brown ground (which always wears badly) and in the central scenes, particularly on the chair seat with Europa which looks all too pale and sickly to be 17th or 18th century in colouring. The blue C-scrolls round the Fable also look like a modern blue - too grey - but that could be poor colour printing. You can probably detect reweaving by feeling the surface. New wool is fluffy, old worsted harsh. New silk feels slimy rather than silky. 'Dead' areas in the sky are certainly rewoven, and faces have been 'restored'.

The embroidered mirror-frame looks typical of the third quarter of the 17th century. Similar pieces can be found in several good collections and appear in salerooms from time to time, but mostly faded, worn and lacking breakable details such as the mica in the windows of the buildings. At the bottom, the female warrior half-length with a spear may represent Minerva. The man above, in feathered hat, appears to be holding a tasselled 'houlette', which could indicate either a character from a pastoral, or Paris, or Apollo when disguised as a shepherd.

There are, however, at least two mirror frames with related figures (see xerox enclosed) that confuse rather than clarify these identifications. In both females-with-a-spear she appears in front of tents (1) or a tent with figures inside, possibly Jael and Sisera or Judith and Holophernes (2). In the case of (2), Judith is represented top left and Jael bottom right. So the central figure in

Figura 9. Carta da conservadora de têxteis do Museu V&A. Arquivo da Casa-Museu Medeiros e Almeida, Lisboa.

2.

front of a wall (who has a spear in (1) and what looks like a 'houlette' in (2)!) is more likely to represent Fortitude than Minerva. The male figure, also in front of a wall in (1), where he carries a rod or staff of office, carries in (2) a shepherd's crook (which seems to show that the strange object in your mirror-frame is a 'houlette') and also a globe or orb. He stands in front of buildings, as in your mirror, and must be the same character. Perhaps he is a Virtue too? or a rather strange version of the Good Shepherd? The two half-figures may be intended to personify the virtues of the king and queen in the sides of the frame.

I hope this is some help.

Yours sincerely

Wendy Hefford

Miss Wendy Hefford
Deputy Curator
Textiles and Dress

Enc

Figura 9 *(continuação).*

Figura 10. Reserva inferior. figura feminina (pormenor). Fotografia: Arquivo da Casa-Museu Medeiros e Almeida, Lisboa.

têxteis do Victoria & Albert Museum (V&A), de Londres, que escreveu à Casa-Museu sugerindo a identificação da personagem masculina em medalhão como "a character from a pastoral, or Paris, or Apollo when disguised as a sheperd". Esta sugestão é suportada pela lança que a personagem sustenta na mão, que a conservadora interpreta enquanto um *cajado* (*houlette*) (Figura 11).

Num exercício livre de interpretação, permitimo-nos avançar outra hipótese: a figura ostenta o mesmo bigode, mosca e longos cabelos que as representações típicas coevas do monarca, traja uma capa segura por um laço e joia com mineral falso ladeado por quatro aljôfares e ostenta uma lança com borla na ponta (que pode ser entendida enquanto regalia real), não se assemelhando à figuração tradicional de um pastor (talvez um deus transformado em pastor). Na cabeça usa uma estranha coroa de plumagem colorida, ornada na base por cuidada fiada de aljôfares e pedraria falsa que poderá simbolizar o continente americano. Assim sendo, uma das conclusões possíveis seria que se trata de uma representação de Carlos II, talvez mais jovem, numa alusão ao seu papel na América do Norte, já que aí fundou, em 1663, as colónias da Pensilvânia, Nova Jérsia e da Carolina (esta última foi assim batizada em honra de seu pai Carlos I).

53

The Property of a Gentleman

53 A FINE CHARLES II NEEDLEWORK MIRROR, the rectangular plate contained in a shaped frame faced with yellow and brown tortoiseshell; the sides with a king and queen with pearl crowns, flowing blue and brown ermine-trimmed robes and dragons at their feet, the remainder with Biblical figures, including Delilah and Jael, in polychrome silks on a white satin ground in a large variety of stitches, including purl, and enclosed by oval laurel wreaths, the remainder scattered with well-drawn flowering branches, 3*ft. 5in. high by 2ft. 5in. wide*

Figura 11. Espelho anunciado na leiloeira Sotheby's, 24 de abril de 1959, Arquivo da Casa-Museu Medeiros e Almeida, Lisboa.

Em relação à figura feminina em medalhão, a conservadora do V&A sugere a representação de Minerva devido à lança que ostenta: "the female warrior with a spear may represent Minerva" ou ainda, como em casos semelhantes, simplesmente a personificação das virtudes da rainha (Figura 11).

A reserva está ladeada, à esquerda, por um leão deitado, frente a uma curiosa planta com flores diferentes em cada ramo, que poderão até demonstrar algum rigor científico mas que aqui se encontram com sentido puramente decorativo, e por um leopardo, à direita, sentado frente a uma planta semelhante. Estes animais, apesar de poderem ser considerados simplesmente como animais exóticos podem, neste contexto, ser entendidos enquanto símbolos da monarquia inglesa. Verifica-se neste facto uma confusão gerada na Idade Média quando, erroneamente, se identificaram leopardos nas armas inglesas, em vez de leões, aos quais, em termos heráldicos se chamam *leopardos*, quando em posição de movimento, com a cabeça virada para o espetador (*lion passant guardant*). O leão que figura nas armas da coroa inglesa está de pé, com as patas apoiadas no escudo e chama-se *lion rampant*. O erro persistiu, porém, no imaginário e no bestiário, sendo os dois animais considerados *bestas reais*.

Entre os materiais deste exemplar, e apesar da impossibilidade de manusear o objeto diretamente (e do desconhecimento técnico da autora sobre têxteis), identificam-se tecidos vários, em seda (usados no suporte e nas vestes dos monarcas) e algodão (vestes dos monarcas, cortinas), assim como diferentes tipos de fios para bordar: de lã (cabelos), algodão (flores), seda (flores) e laminado com lâmina dourada (os cetros estão envoltos em lâmina dourada que oxidou pelo que se encontram escurecidos) e prateada (passamanaria da casaca do rei – também escurecida –, franjas do vestido da rainha, simulação de água nos lagos das reservas superiores), além de outros materiais têxteis aplicados como renda (golas e mangas dos monarcas, vestido da rainha, *embrasses* das cortinas, pétalas de flores, folho da reserva superior), cordão (punhos da rainha), galão (baldaquinos) e franja (vestido da rainha, baldaquinos e cortinas), que ajudam a formar os diversos tipos de figuras e decorações.

Quanto a outro tipo de materiais empregues, distinguem-se aljôfares nas coroas, joias, punho do cetro e fivelas dos sapatos, pequenas lâminas de mica incolor a simular as janelas das arquiteturas, pedras falsas incolores e facetadas (o único elemento com sinais de decomposição ativa) a simular diamantes nas joias dos reis (coroa, cetro e pendente do monarca e na coroa e pregadeira da rainha) e metal que se encontra no globo, nas fivelas dos sapatos,

na corrente e pendente do colar (algum deste material poderá ser prata escurecida).

A peça é de dimensões consideráveis, medindo a moldura 58,4 cm de altura por 45,7 cm de largura e o espelho 48,5 cm de altura por 35 cm de largura. O espelho, no qual se verificam zonas de escurecimento devido a faltas do prateado original (aplicado na parte de trás) provocadas pelo tempo, será provavelmente produção da fábrica inglesa Vauxhall Glassworks. Trata-se de uma manufatura reabilitada por Georges Villiers, 2.º duque de Buckingham (1628-1687), logo após a restauração da monarquia, que laborou praticamente em monopólio entre 1663 e 1780 e produziu placas de vidro soprado para janelas (utilizadas em casas e carruagens) e espelhos [8].

A peça não se encontra assinada nem datada.

O estado de conservação é bom, com ressalva dos aspetos já identificados; o trabalho de bordado está praticamente sem falhas e as cores mantêm-se vivas. Uma avaliação técnica, com recurso a um saber científico seria absolutamente necessária para avaliar o verdadeiro estado de conservação, identificar técnicas e estabelecer a identificação e proveniência de todos os materiais envolvidos nesta obra.

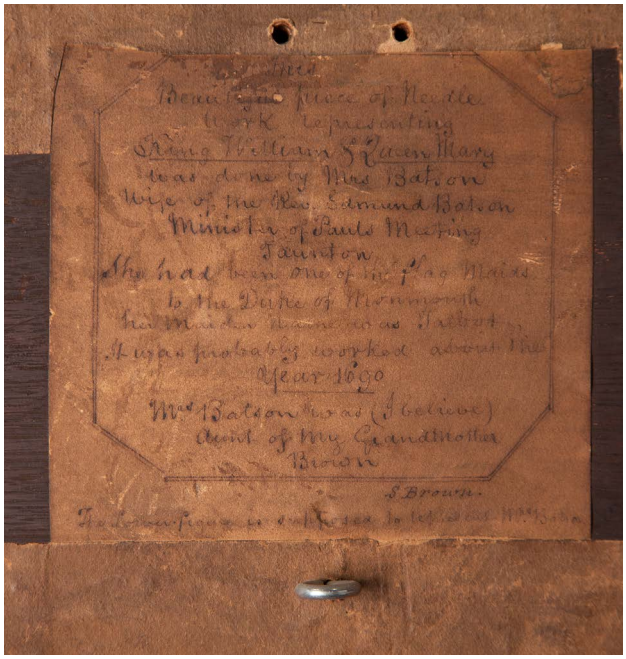


Figura 12. Etiqueta no verso do espelho, escrita por S. Brown, Fotografia: Arquivo da Casa-Museu Medeiros e Almeida, Lisboa.

Da proveniência do espelho

Na parte posterior do espelho encontra-se colada uma etiqueta com a seguinte anotação (Figura 12):

> This beautiful piece of needlework representing
> King William and Queen Mary
> was done by Mrs. Batson wife of the Reverend Edmund Batson
> minister of Pauls Meeting Taunton
> She had been one of the flag maids to the Duke of Monmouth
> her maiden name as Talbot
> it was probably worked about the year 1690
> Mrs Batson was (I believe)
> aunt of my grandmother Brown
> S. Brown
> The lower figure is supposed to represent Mrs. Batson.

A nota contém vários erros ou imprecisões que interessam salientar: a autora começa por afirmar que o casal real são os reis Guilherme e Maria. Porém, durante o seu reinado (1689-1702), este tipo de trabalho já se encontrava em declínio, sendo os casais reais mais representados Carlos I e Henriqueta Maria [4, p.282] e Carlos II e Catarina de Bragança. Afirma de seguida que uma tal de Mrs. Batson é a autora do trabalho, que era criada do 1.º duque de Monmouth (filho ilegítimo do rei Carlos II, Jaime Scott, 1649-1685) e que essa senhora era tia da sua avó, S. Brown, terminando por afirmar que a figura representada na reserva do espelho é a suposta Mrs. Batson (à laia de retrato). Devido às razões anteriormente apresentadas, esta possibilidade é altamente improvável, permanecendo a autoria do espelho como desconhecida.

Mrs. Batson é mencionada no texto como tendo sido *one of the flag maids* do duque. Apesar de vários esforços junto de colegas ingleses, este termo ainda não foi devidamente identificado. Sendo Monmouth um militar, atendendo ao termo *flag* que se traduz por bandeira ou estandarte, e estando-lhe atribuído este trabalho de agulha, admite-se que ela pudesse ser uma empregada encarregue das suas fardas, estandartes e demais parafernália têxtil militar.

O Reverendo Edmund Batson (c. 1675-1735) e mulher eram naturais da (hoje) cidade de Taunton, no condado de Somerset, no sul de Inglaterra. Foi nesta localidade que o Reverendo exerceu funções na Igreja Congregacional Paul's Meeting, referida no texto, desde 1706 até à sua morte [9]. O local de produção da peça será certamente Inglaterra mas poderá ter sido feita tanto em Londres como numa outra cidade ou casa de campo da província.

De acordo com a etiqueta nas costas do espelho, o bordado terá alegadamente sido realizado por Mrs. Talbot Batson, após o que terá passado para a posse de S(?). Brown, sobrinho(a) neto(a) da referida senhora (meados do século XVIII). Existe de seguida um período largo em que o paradeiro da peça é desconhecido.

Posteriormente, ainda em data desconhecida, segundo indicações de outras duas etiquetas coladas no tardoz do espelho (estas etiquetas eram colocadas pelos antiquários durante o processo de transporte ou devido a um processo de cedência da peça para alguma exposição), pertenceu à coleção do Capitão J. H. Reynolds, membro dos Grenadier Guards, morador em 145, Victoria Street, Londres (Figura 13).

Documentalmente, o que é certo é que em março de 1962 o espelho se encontrava na posse do antiquário Delomosne & Son Ltd., agente londrino, com o qual

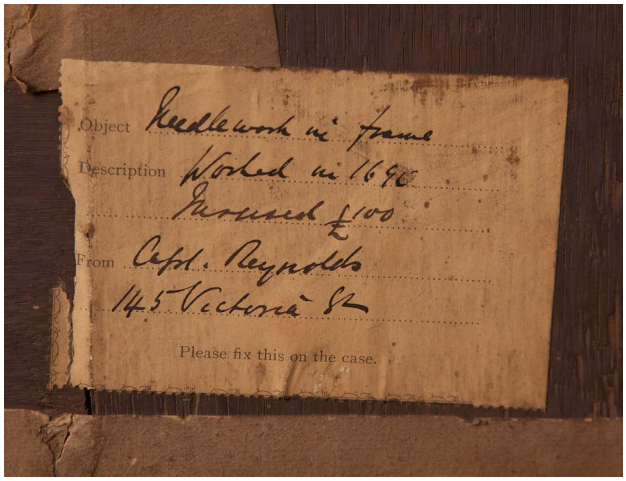


Figura 13. Etiqueta no verso do espelho com dados do Capitão J. H. Reynolds. Fotografia: Arquivo da Casa-Museu Medeiros e Almeida, Lisboa.

o colecionador Medeiros e Almeida realizou diversas transações, estando porém emprestado para uma exposição temporária no Victoria & Albert Museum, de Londres (*Exposição de Tesouros Artísticos Internacionais*, que decorreu entre 2 de março e 29 de abril desse ano).

Medeiros e Almeida teve conhecimento da peça através de um anúncio na revista *Country Life* de 1 de março de 1962 (uma entre as muitas publicações que assinava, nomeadamente revistas de arte, através das quais tomava conhecimento de obras de arte que estavam no mercado), onde surgia, acompanhada de fotografia a preto e branco, descrita como (Figura 14):

> A Stuart period mirror with stumpwork surround of superb quality depicting the figures of Charles II and Queen Catherine: original tortoiseshell frame and mirror plate - On loan to the Exhibition from Messrs. Delomosne & Son Ltd. 4, Campden Hill Road Kensington High Street, London, W. 8.

Ainda de acordo com outra etiqueta, a referida exposição foi realizada com o patrocínio da Confederação de Associações de Revendedores de Arte e Antiguidades (C.I.N.O.A.) (Figura 15).

O espelho foi adquirido por Medeiros e Almeida na casa Delomosne & Son Ltd., em Londres, a 6 de abril de 1962, pela quantia de 900 libras estrelinas. De início o antiquário pediu £1.050 e o colecionador, como era seu hábito, conseguiu que o preço baixasse 150 libras, acabando por pagar £900 (Figura 16).

Considerações finais

A qualidade do bordado das personagens principais, onde se situa a grande parte de trabalho em *stumpwork* deste espelho, confere a esta peça um lugar entre os exemplares que podem ser categorizados como *eruditos*.

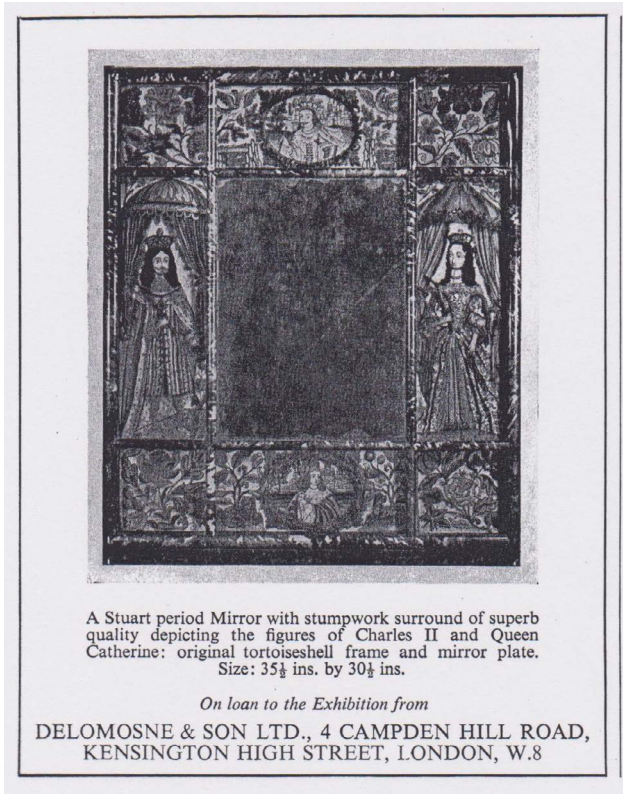
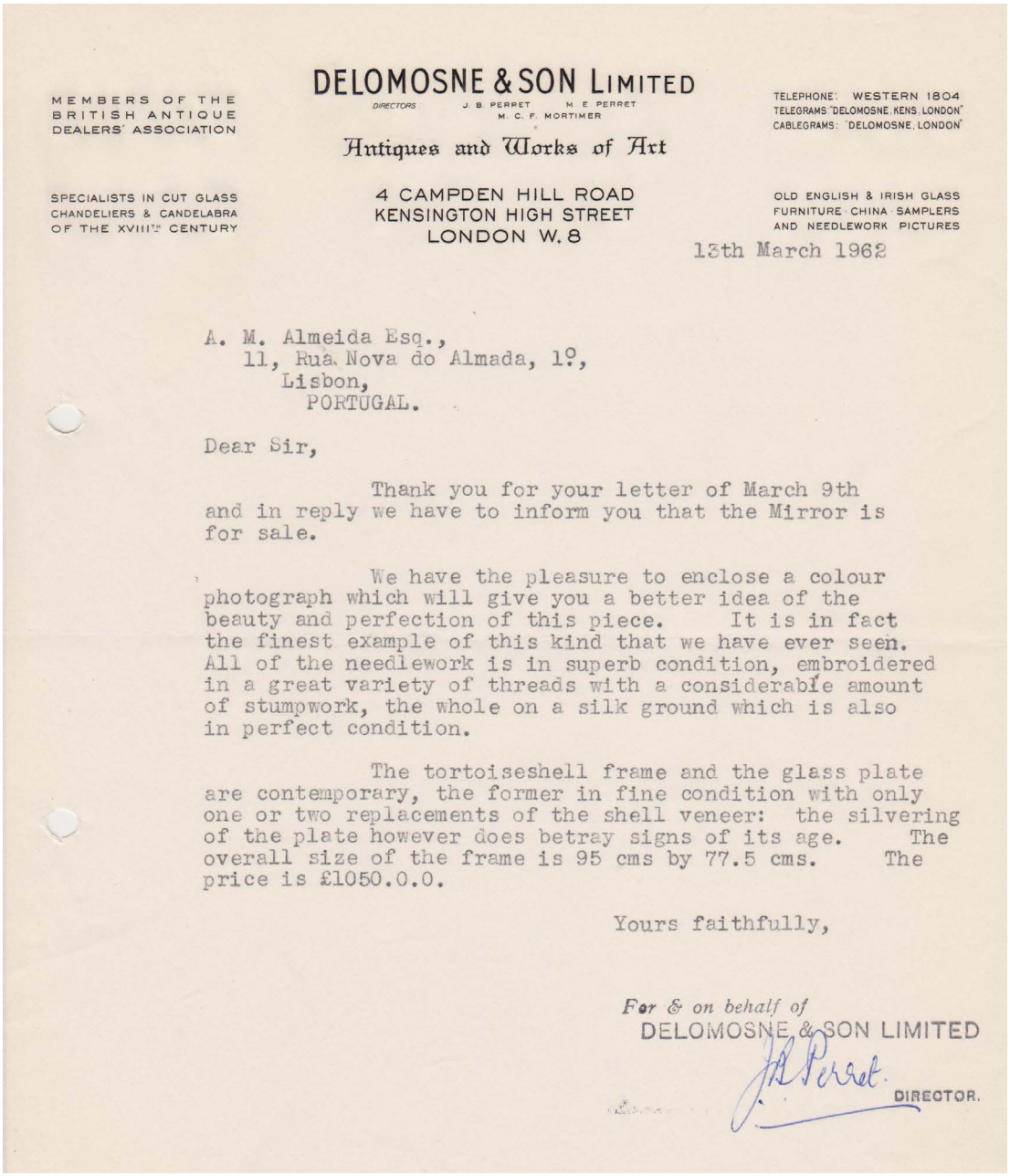


Figura 14. Anúncio do espelho na revista *Country Life*, 1962, Arquivo da Casa-Museu Medeiros e Almeida, Lisboa.

Figura 15. Etiqueta da exposição CINOA. Fotografia: Arquivo da Casa-Museu Medeiros e Almeida, Lisboa.



MEMBERS OF THE BRITISH ANTIQUE DEALERS' ASSOCIATION

DELOMOSNE & SON LIMITED

DIRECTORS J. B. PERRET M. E. PERRET M. C. F. MORTIMER

Antiques and Works of Art

SPECIALISTS IN CUT GLASS CHANDELIERS & CANDELABRA OF THE XVIIIth CENTURY

4 CAMPDEN HILL ROAD
KENSINGTON HIGH STREET
LONDON W. 8

TELEPHONE: WESTERN 1804
TELEGRAMS "DELOMOSNE, KENS, LONDON"
CABLEGRAMS: "DELOMOSNE, LONDON"

OLD ENGLISH & IRISH GLASS FURNITURE · CHINA · SAMPLERS AND NEEDLEWORK PICTURES

13th March 1962

A. M. Almeida Esq.,
11, Rua Nova do Almada, 1º,
Lisbon,
PORTUGAL.

Dear Sir,

Thank you for your letter of March 9th and in reply we have to inform you that the Mirror is for sale.

We have the pleasure to enclose a colour photograph which will give you a better idea of the beauty and perfection of this piece. It is in fact the finest example of this kind that we have ever seen. All of the needlework is in superb condition, embroidered in a great variety of threads with a considerable amount of stumpwork, the whole on a silk ground which is also in perfect condition.

The tortoiseshell frame and the glass plate are contemporary, the former in fine condition with only one or two replacements of the shell veneer: the silvering of the plate however does betray signs of its age. The overall size of the frame is 95 cms by 77.5 cms. The price is £1050.0.0.

Yours faithfully,

For & on behalf of
DELOMOSNE & SON LIMITED

J. B. Perret.
DIRECTOR.

Figura 16. Documentação processo de compra com Delosmone & Son Ltd., Arquivo da Casa-Museu Medeiros e Almeida, Lisboa.

A peça terá sido realizada por mão adulta, provavelmente nobre, o que é revelado pela variedade e complexidade das técnicas e pontos utilizados, não se enquadrando no tipo de produção que começava por ser feito em mais tenra idade, que se associa a pequenos objetos utilitários e a uma criação mais fantasiosa, percetível tanto na execução mais deficiente, como na escolha das temáticas, geralmente de âmbito mais ingénuo.

Sendo um exemplar com caraterísticas eruditas não é, porém, dos mais ricos a nível têxtil, no que respeita à variedade de materiais utilizados, apresentando pouca quantidade de fio de prata e de ouro, de contas e de canutilhos. Pelo contrário, a moldura exibe quantidade apreciável de tartaruga e correspondente folha de ouro que enobrece a peça.

Atendendo à tipologia de espelho de parede (no início da produção prevaleciam os espelhos de mesa, logo de menor porte), à iconografia real e à qualidade da composição – bem estruturada a sugerir um suporte inspirado em estampa (originalmente havia muito desenho livre e como tal, desorganizado, sendo após a Restauração que se *profissionaliza* a produção deste tipo de bordado) –, sugere-se uma execução que aponta para a segunda metade do século, concretamente para finais do reinado de Carlos II. Assim, a datação indicada pela inscrição no verso da peça, 1690 parece-nos um pouco tardia para este trabalho que, por comparação com

exemplares datados, pertencentes a acervos de museus, leiloeiras e outros registados em publicações, poderá ser atribuído a finais do terceiro quartel do século XVII, cerca de 1660-1675.

Esta opinião é corroborada pela já referida Wendy Hefford que afirma: "the embroidered mirror-frame looks typical of the third quarter of the 17th century" [6, p. 283; 10, p. 195; 11, p. 358].

O espelho pertencente ao acervo da Casa-Museu Medeiros e Almeida foi, pois, criado num âmbito socioeconómico elevado, seja pela qualidade do trabalho como dos materiais empregues, bem como pela temática abordada e sua harmoniosa composição, podendo ser considerado um objeto de luxo.

Referências

1 Peranteau, A.; Carlson, J.; Mass, J., 'The technical analysis of two pieces of 17th century English embroidery', in *Scientific Analysis of Ancient and Historic Textiles: Informing Preservation, Display and Interpretation*, eds. P. Wyeth & R. C. Janaway, Archetype Publications, London (2005) 24-30.

2 Leslie, C. A., *Needlework through History. Handicrafts through World History – An Encyclopedia*, Greenwood Press, Westport, Connecticut (2007) 210-212.

3 Lewandowski, D. E., 'Raised work – stump work. A confusion of terms' (2002), in *The Art of Embroidery Heritage Shoppe*, http://www.joshuatree-national-park.com/heritageshoppecom/heritage/essays/raisedwork.html (acesso em 2018-11-20).

4 Remington, P., *English Domestic Needlework of the XVI, XVII and XVIII Centuries,* The Metropolitan Museum of Art, New York (1945).

5 Ashton, L., 'Martha Edlin: a Stuart embroideress', T*he Connoisseur* **323** (1928) 215-223.

6 Kendrick, A. F., 'Embroideries in the collection of Sir Frederick Richmond, Bart', *The Connoisseur* **95** (1935) 282-288, 317-321.

7 Watt, M., 'English embroidery of the Late Tudor and Stuart Eras' (2010) in *Heilbrunn Timeline of Art History,* The Metropolitan Museum of Art, https://www.metmuseum.org/toah/hd/broi/hd_broi.htm (acesso em 2018-6-8).

8 Stanley, M., 'Vauxhall Glassworks', in *Vauxhall, the Oval and Kennington*, https://www.vauxhallandkennington.org.uk/glassworks.shtml (acesso em 2018-6-10).

9 Toulmin, J., *The History of Taunton, in the County of Somerset*, London (1822).

10 Symonds, R.W., 'Carved and gilt Carolean looking-glasses', *The Antique Collector* **19**(6) (1948) 193-198.

11 Macquoid, P.; Edwards, R., *The Dictionary of English Furniture, from the Middle Ages to the Late Georgian Period*, vol. 2, Offices of Country Life, London & Charles Scribner's Sons, New York (1924).

Recebido: 2018-6-21
Revisto: 2018-11-26
Aceite: 2018-12-14
Online: 2019-3-6

Estudos sobre têxteis históricos
Studies in historical textiles
A. Serrano, M. J. Ferreira, E. C. de Groot (ed.)

Nota / Note

Paramentos bordados: ocorrências na ilha Terceira (Açores)

Maria Manuel Velasquez Ribeiro

Museu de Angra do Heroísmo, Ladeira de S. Francisco, 9700 Angra do Heroísmo, Portugal
CHAM-A, Centro de Humanidades, Universidade dos Açores, Rua da Mãe de Deus, Edifício das Ciências Humanas – Sala 6, 9501-855 Ponta Delgada, Portugal
maria.mv.ribeiro@azores.gov.pt

Resumo
Alguns estudos oitocentistas atribuíram a um conjunto de paramentos com sebastos bordados aplicados sobre veludo existentes na Igreja do Colégio de Angra do Heroísmo (Ilha Terceira-Açores) origem inglesa e datação incerta, mas anterior ao século XVI. Um outro conjunto de casula e estola, também com sebastos bordados, existente numa igreja rural da ilha (Ribeirinha), permanece uma incógnita quanto à origem e processo de incorporação nos bens da paróquia. Partindo dessas premissas, procurou-se aprofundar o conhecimento sobre a sua permanência nos Açores, reequacionar a origem temporal e geográfica e reconstruir o processo através do qual se foi reconhecendo e efetivando a sua patrimonialização.

Palavras-chave
Paramentos bordados
Companhia de Jesus
Igreja do Colégio de Angra
Igreja da Ribeirinha
Angra do Heroísmo
Açores

Embroidered vestments: findings in the Terceira Island (Azores)

Abstract
A set of vestments with embroidered orphreys applied on velvet fabric, belonging to the Church of the College of Angra do Heroismo (Terceira Island, Azores), have been attributed, by 19th-century studies, to an English origin and unknown date, but prior to the 16th century. Another set found in a rural church of the island (Ribeirinha), comprises a chasuble and a stole, with embroidered orphreys as well. The origins of this set and its incorporation into the assets of the parish remain uncertain. This article attempts to deepen the knowledge about the presence of these liturgical textiles in the Azores along with their date and place of production and it aims to reconstruct the process of their recognition and consolidation as cultural heritage objects.

Keywords
Embroidered vestments
Society of Jesus
College of Angra Church
Ribeirinha Church
Angra do Heroísmo
Azores

ISSN 2182-9942

Conservar Património **31** (2019) 191-201 | https://doi.org/10.14568/cp2018029
ARP - Associação Profissional de Conservadores-Restauradores de Portugal
http://revista.arp.org.pt

O povoamento das ilhas açorianas foi acompanhado a par e passo pela disseminação da rede de paróquias e de agentes da igreja católica por todas as ilhas, constituindo-se a diocese de Angra (criada em 1534), a par dos municípios, a instituição mais antiga dos Açores.

Necessária à sua sobrevivência, a competência académica e doutrinal dos prelados assumirá particular preocupação para a hierarquia diocesana que demonstrará, igualmente, uma eficaz capacidade de utilizar os meios de comunicação que, em cada época, se lhe foram disponibilizando [1].

Mosteiros e conventos partilham da mesma missão de doutrinação catequética, cabendo aos franciscanos a primazia da constituição, nas suas casas, de classes de primeiras letras, latim e moral. A chegada dos jesuítas a Angra, em 1570, e a Ponta Delgada, em 1591, amplia a oferta de ensino, sendo que os colégios da Companhia e as competências dos seus consagrados estabelecem-nos como os principais diretores espirituais das elites, força moral, política e intelectual do meio, e responsáveis pela abertura de diferentes aulas e colégios [2]; são, justamente, os principais responsáveis pela escassa presença conhecida de paramentos bordados na diocese: duas casulas e duas dalmáticas em Ponta Delgada [3, pp. 62-79 e 122-126; 4, pp. 25-28], e cinco peças ainda hoje pertencentes à Igreja do Colégio de Angra. A exceção pertence à igreja paroquial da freguesia rural da Ribeirinha (ilha Terceira), que guarda duas peças bordadas praticamente desconhecidas. As de Ponta Delgada e Angra, porém, suscitaram o interesse de alguns estudiosos, desde a ultima década de oitocentos, devido à inusitada proveniência e datação que lhes atribuíram e que remete para a Inglaterra quatrocentista; contudo, o percurso da sua patrimonialização e as circunstâncias e agentes que, promovendo a sua retirada do contexto funcional que lhes era próprio, conduziram ao seu reconhecimento como "os mais famosos paramentos existentes na diocese" [5] como lhes chamou o historiador local João Afonso, não foram suficientes para promover o aparecimento de mais contributos que expliquem, justifiquem e avaliem a sua singularidade e presença nos Açores. A reflexão em torno das peças terceirenses é, portanto, o objeto deste artigo.

As peças da Igreja do Colégio de Angra

As cinco peças – duas casulas, dois manípulos e uma estola – parecem agrupar-se em dois conjuntos cujas peças se relacionam pela função litúrgica a que se destinam, e pela semelhança da cor e do tipo de tecido de suporte.

Assim, um dos conjuntos é constituído por uma casula e o respetivo manípulo, ambos em tecido de veludo cor de vinho forrados a tecido de seda natural da mesma cor, a primeira, e bege, o segundo. A casula de formato periforme à frente e amplo atrás é rematada a toda a volta, no decote redondo e nos cortes descaídos dos ombros, por galão em fio de seda vermelho tecido e franjado a fio laminado dourado (Figura 1). É atravessada longitudinalmente, na

Figura 1. Casula vermelha do colégio jesuíta de Angra – frente. Fotografia: MAH / Paulo Lobão.

frente e nas costas, por sebastos retos com representações iconográficas bordadas (bordado direto e de aplicação) a fio de seda e fio laminado dourado e prateado sobre tecido de linho [3, pp.180-183], sebastos esses contornados por galão de algodão amarelo, embora imagens fotográficas de 1971 e descrições produzidas aquando do envio das peças para conservação e restauro, em 1991, confirmem que, então, o galão que debruava o sebasto frontal se prolongava até aos ombros contornando os lados do decote, e que os sebastos eram contornados por galão idêntico ao que debruava toda a casula. Só após a intervenção, e talvez em resultado da inutilização do galão original, os sebastos foram contornados pelo galão de algodão amarelo mesclado de verde, que antes contornava o manípulo (agora no sebasto frontal), e um galão diferente em algodão amarelo (agora no sebasto posterior).

O manípulo (Figura 2) é contornado por galão igual ao da orla da casula e apresenta remate nas extremidades com galão tecido e franja de fio de algodão cor de vinho e dourado; no lado exterior da parte que assenta no braço é ornamentado com uma cruz em galão dourado e, no lado interior, possui um cordão cor de vinho que termina em borla.

Na superfície bordada conjuga-se a utilização de diferentes pontos executados com fios de seda e fios laminados em diversas tonalidades, cuja análise – efetuada em fibras dos tecidos de suporte (linho e seda), nas linhas de coser o galão, no fio do galão dos sebastos, no núcleo do fio metálico e nos fios do bordado do sebasto –, permitiu apurar que os corantes usados no seu tingimento foram a garança e a cochinilha (para os vermelhos), o açafrão (para os amarelos) e o índigo (para os azuis). Algumas cores foram obtidas através da mistura de corantes e da mistura de fios de cores diferentes: foi assim para as várias tonalidades de azul obtidas pela mistura do corante índigo e um pouco de açafrão, mas também pela junção de fios de seda tintos com índigo e alguns fios tintos com açafrão; o verde foi obtido pela junção dos corantes índigo e açafrão. Essa variedade técnica e cromática e o preenchimento interior de algumas zonas com papel de linho (até agora, o único tipo de enchimento detetado aquando da intervenção de restauro [6]) conferem expressividade e volume às cenas bordadas.

A iconografia bordada apresenta uma sequência narrativa de vários passos da vida de Jesus organizados em quadros delimitados pela representação de estruturas arquitetónicas que sugerem pequenas edículas, embora o desgaste pelo uso de algumas zonas e os cortes a que os sebastos foram sujeitos dificulte a identificação de algumas figuras e seus atributos.

Nos quadros do sebasto frontal surgem as seguintes cenas com as possíveis identificações:

- 1.º quadro – cena do *Nascimento de Jesus*, ou a da *Virgem e Santa Ana*: à esquerda, uma figura aureolada envergando manto azul está ajoelhada defronte de outra que, de mãos postas, enverga capa vermelha sobre túnica branca.
- 2.º quadro – cena da *Visitação,* ou da *Anunciação*: figura à esquerda, de pé, enverga manto azul sobre túnica branca enquanto outra, à direita, aureolada, veste túnica branca proeminente, à frente, e manto vermelho.
- 3.º quadro – cena da *Anunciação*, ou a da *Visita a Santa Isabel*: à esquerda, uma figura alada de perfil, enverga manto vermelho e olha para a figura aureolada à sua frente, que usa manto verde preso

Figura 2. Manípulo atribuído à casula vermelha do colégio jesuíta de Angra – frente. Fotografia: MAH / Paulo Lobão.

Figura 3. Casula vermelha do colégio jesuíta de Angra – costas. Fotografia: MAH / Paulo Lobão.

Figura 4. Estola atribuída à casula amarela do colégio jesuíta de Angra. Fotografia: MAH / Paulo Lobão.

no colo por grande fecho redondo; entre ambas uma pomba pouco percetível.

O sebasto posterior (Figura 3) apresenta a representação de três edículas arquitetonicamente idênticas às do sebasto frontal acrescidas, no topo, por um segmento pouco visível onde é possível identificar dois anjos a ladear algo que Alarcão [3, p. 181] e Fulford-Williams [7, p. 11] interpretam de forma diferente: a representação de figura humana a meio corpo sobre nuvem, ou a extremidade de um leito, remetendo, o primeiro, para uma cena mortuária e o segundo para a representação da *Natividade*.

A sequência dos quadros apresenta as seguintes cenas:

- 1.º quadro – cena da *Adoração dos Magos*, ou a da *Apresentação no Templo*: a Virgem, aureolada, está sentada com o Menino no regaço, envergando túnica verde debruada a dourado e manto de cor bege; a figura masculina à direita, ajoelhada, usa túnica esverdeada com mangas vermelhas e gola castanha, e destapa um cibório que apresenta à criança (Simão ou um dos reis magos?). Por trás desta, surge um busto masculino que enverga túnica vermelha e cabeção verde. Para além do pavimento axadrezado e do fundo em paliçada de ripas pontiagudas, distingue-se um fundo paisagístico.
- 2.º quadro – cena da *Apresentação de Jesus no Templo*, ou da *Epifania*: num estrado sobre pavimento axadrezado, a Virgem segura o Menino que se inclina para os braços de um velho, de pé, à sua frente, atrás do qual surgem mais duas cabeças; outra figura masculina, posicionada à frente da Virgem, parece vestir um hábito cingido por cíngulo e segura na mão um cesto; a serem as ofertas feitas

Figura 5. Barra das extremidades da estola atribuída à casula amarela do colégio jesuíta de Angra. Fotografia: MAH / Paulo Lobão.

por esta ocasião ao Templo, esta seria a imagem de S. José.

- 3.º quadro – cena de *Jesus entre os Doutores no Templo*: Jesus criança, sentado ao centro, enfrenta duas figuras também sentadas que se lhe dirigem com um livro aberto, enquanto a Virgem, de pé, à direita, cobre a cabeça com um manto verde.

O segundo conjunto, integra uma casula, um manípulo e uma estola. Todas as peças são confecionadas em tecido de veludo de cor bege e estão forradas com tecido de seda da mesma cor que lhes foi aplicado aquando da intervenção de conservação e restauro a que foram sujeitos. Na estola e no manípulo (Figuras 4-5), o galão do contorno é tecido em fio de algodão amarelo e as extremidades ostentam faixas com motivos vegetalísticos e florais bordados a fio dourado e polícromo, e as letras AM (na estola), EF e IO (no manípulo); ambos terminam em franja dourada.

A casula, periforme à frente e ovalada atrás, é contornada a toda a volta e no decote, redondo, por galão em fio de seda tecido e franjado a fio laminado dourado. A frente (Figura 6) apresenta um sebasto reto bordado sobre tecido de linho debruado por galão tecido em fio de seda verde e dourado, enquanto o sebasto posterior se apresenta em forma de cruz e é rematado por galão idêntico ao do contorno da casula. Antes da intervenção de conservação e restauro o sebasto frontal era debruado com galão idêntico ao que contornava toda a casula, mas a intervenção revelou que, por baixo deste, se encontrava o galão primitivo, optando-se por mantê-lo visível e remover o outro [8].

Da mesma forma que na casula vermelha, também aqui as representações iconográficas bordadas surgem em quadros inseridos em representações de edículas embora arquitetonicamente diferentes; a sequência dos quadros, na frente, é a seguinte:

- 1.º quadro – representação da *Sagrada Família*: duas figuras aureoladas trajando mantos, uma delas com um bordão, e a criança com o que parece ser um livro (ou uma pomba) nas mãos.
- 2.º quadro – figuras não identificadas: a da esquerda, aureolada, envergando manto branco e livro na mão e a da direita com veste muito trabalhada e cabeção que lhe cobre a cabeça.
- 3.º quadro – Santa Margarida e Santa Catarina: figura à esquerda coroada e com um livro e uma foice nas mãos e figura à direita com uma pequena roca e um livro nas mãos.

O sebasto cruciforme posterior (Figura 7) apresenta, no topo, a representação do *Pai Eterno* em busto, sobre o que parece ser uma nuvem chinesa, na interpretação de Teresa Alarcão. Entre essa nuvem, a Pomba do Espírito Santo, que completaria a representação da Santíssima Trindade, sendo o conjunto Pai Eterno/Pomba rematado por uma tarja com o acrónimo INRI.

Na interseção da cruz está a representação da *Crucificação* estando Jesus Cristo ladeado por dois anjos com asas muito recortadas, vestes em movimento ascensional e cálices nas mãos que aparam o sangue derramado pelas mãos cravadas na Cruz. Uma figura lateral, aos pés de Cristo, à esquerda, ajoelhada em adoração, com veste escura e um possível cabeção ou capuz, parece tratar-se de um monge, talvez o doador, dada a sua dimensão e posição na composição. Alguns autores [7] identificam esta figura, também com um cálice, como um outro anjo enquanto outros [9, p. 25; 3] sugerem a possibilidade deste elemento bordado poder ter sido aplicado posteriormente. A meio do corpo de Cristo, por trás, uma tarja que, possivelmente, teria uma inscrição.

Figura 6. Casula amarela do colégio jesuíta de Angra – frente. Fotografia: MAH / Paulo Lobão.

Abaixo desta representação, dois quadros inseridos em edículas idênticas às do sebasto frontal apresentam as seguintes cenas:

- 1.º quadro – S. João e a Virgem: figura à esquerda com manto cobrindo a cabeça e as mãos cruzadas sobre o peito e à direita figura com manto e um livro nas mãos.
- 2.º quadro – Santa Úrsula de Colónia e Santa Apolónia de Alexandria: duas figuras femininas, ambas com mantos brancos, sendo a da esquerda

coroada e com uma seta invertida nas mãos e três minúsculas figurinhas sob o manto, atributos que aludem ao martírio de Santa Úrsula e ao das onze mil virgens que a acompanhavam; e a da direita com a torquês do martírio de Santa Apolónia nas mãos.

Um processo de patrimonialização

O reconhecimento do interesse patrimonial dos paramentos antigos do Colégio de Angra esteve associado, desde o início, ao grupo de paramentos bordados existentes na Matriz de Ponta Delgada (ilha de S. Miguel) ornamentados com motivos heráldicos ingleses (as duas casulas),e cenas da vida de Cristo (as duas dalmáticas), entre os quais se acharam semelhanças [4, pp. 77-83].

É o estudioso micaelense Luís Bernardo Leite de Ataíde (1883-1955), em 1915, que publica pela primeira vez a descrição das casulas existentes em Ponta Delgada. Muito embora não se detenha na forma como haviam chegado aos Açores, "talvez trazidas pelos jesuítas no século XVI", acrescenta que "estes antiquíssimos bordados vieram envolvidos até 1895 em uma tradição muito incerta e confusa" [10]. Baseado em notas manuscritas do bibliófilo e investigador Ernesto do Canto, Ataíde relata como este as identificara, através dos brasões bordados nos sebastos, como pertencentes ao cardeal John Fisher (1469-1535) e como haviam sido trazidas para os Açores pelo padre Luís Tavares Fisher, filho do primeiro Fisher que se radicara nos Açores – Guilherme –, e padre da Companhia em cuja igreja de Ponta Delgada os paramentos ficaram [11].

Figura 7. Casula amarela do Colégio jesuíta de Angra – costas. Fotografia: MAH / Paulo Lobão.

É com esta proposta de proveniência que parte das peças da Matriz são expostas na *Exposição Retrospectiva de Arte Ornamental Portugueza e Hespanhola* que se realiza em Lisboa e é inaugurada no Palácio Alvor em janeiro de 1882, integrando um conjunto de dezanove bens dos Açores.

Relata Ernesto do Canto que só em 1895, ao mostrá-las ao viajante americano S. R. Koehler, estudioso ligado ao Museu de Belas Artes de Boston e de passagem turística por Ponta Delgada, este as fotografou e, dirigindo-se para Londres, aí consultou o responsável pelo departamento das antiguidades medievais britânicas do British Museum, Sir A. Walleston Franks, que, imediatamente, reconheceu as armas bordadas nos sebastos como sendo as de John Grandisson (1292-1369), barão e bispo de Exeter e, por consequência, a sua datação recuada ao século XIV, contrariamente à datação quinhentista estabelecida pelos especialistas portugueses da *Exposição Retrospectiva*, datação e proveniência que Edith Pycroft (outra *turist* inglesa em viagem por Ponta Delgada, onde se cruza com S. R. Koeller) confirma em texto publicado em 1908 [12].

Importa não esquecer que a patrimonialização destes bens e o seu reconhecimento é feito num contexto em que as repercussões da *Exposição Retrospectiva* se multiplicaram e a atenção aos bens artísticos, especialmente àqueles que se encontravam em palácios e igrejas, foi redobrada. Os inúmeros levantamentos que proporcionou promoveram a realização de exposições distritais (no rol das quais também se inclui a *Exposição Distrital de Artes e Industrias*, em Ponta Delgada, inaugurada a 18 de maio de 1895), além de se terem constituído museus como o de Coimbra (1884), que será o inspirador do Museu da Matriz de Ponta Delgada onde se recolherão as casulas e as dalmáticas após o seu regresso de Lisboa [13, 14].

A relação das peças de Ponta Delgada com as de Angra é estabelecida pelo Coronel Francisco Afonso de Chaves, diretor do Serviço Meteorológico dos Açores, que, nessa qualidade, acompanha os trabalhos de instalação do observatório numa das torres da igreja do antigo Colégio dos Jesuítas de Angra. Numa das suas visitas observa as duas casulas que considera terem a mesma origem das de Ponta Delgada, isto é, a coleção da Catedral de Exeter, considerações que publica em 1919 na *Revista Michaelense.*

Por essa altura, os bens da igreja angrense estavam na posse da Ordem Terceira do Carmo e as casulas, que ainda andavam ao serviço do culto, tinham sido, poucos anos antes, objeto de um restauro suportado pelo comissário da Ordem, o Padre João Evaristo Augusto de Bettencourt.

Tendo em conta a dimensão, o tecido e o tipo de bordado dos sebastos, Afonso Chaves sugere que a casula carmesim, ou cor de vinho, de Angra, em conjunto com as duas dalmáticas da mesma cor de Ponta Delgada, constituiriam um pontifical: a idêntica cor do tecido de suporte (própria das celebrações em dias consagrados a mártires e das cerimónias relacionadas com a Paixão de Cristo) e a sequência da narrativa dos quadros (cenas da Infância e Juventude de Jesus, e cenas da Paixão) denunciariam ser, funcionalmente, um conjunto e trabalho com a mesma origem.

Da mesma forma, a casula rosácea, ou amarela, de Angra ostentaria uma crucificação ladeada por dois anjos, cena semelhante a outra bordada na casula de Ponta Delgada.

Por estes indícios, deduz Afonso Chaves que todos os paramentos, cuja origem inglesa reafirma, teriam vindo

> em época indeterminada para a Egreja dos Jesuitas na ilha de S. Miguel, […] e que d'aqui, só se atendendo ás necessidades do culto, e ao facto de terem duas outras casulas de côr carmezim, de grande valor, mandaram para a Egreja da Ilha Terceira a casula menos interessante à vista, apesar de que ela completava o pontifical com as dalmáticas [9].

O assunto só volta a ser retomado quando, de visita aos Açores em 1960-61, a investigadora Cecily Radford toma conhecimento da existência dos paramentos da Matriz de Ponta Delgada e da identificação que se lhe faz, localmente, de terem pertencido a John Grandisson, bispo de Exeter.

O relato que deste reconhecimento transmite ao seu colega da Devonshire Association, Reverendo H. Fulford Williams, da Catedral de Essex, permite que este dê início, em novembro de 1961, a uma troca de correspondência com os investigadores Carreiro da Costa, em Ponta Delgada, e José Agostinho, em Angra.

Fulford Williams, antigo capelão da S. George's Church, igreja anglicana de Lisboa (1937-1945), havia então terminado algumas pesquisas que envolviam a ilha Terceira, nomeadamente o episódio da derrota de António, Prior do Crato, frente ao marquês de Santa Cruz, em 1584, e a sua posterior estadia de três meses em Exeter, junto do Mayor John Davy. A pesquisa de Williams relacionava-se com a tradição familiar de se dever a essa relação com D. António a presença no brasão de armas dos Davy da representação de um maçarico *(Chloroceryle),* mais conhecido por martim-pescador.

Dado o seu conhecimento da língua portuguesa, as autoridades da Catedral de Exeter encarregam-no de investigar o assunto, já que a existência destes paramentos e da sua eventual ligação à catedral era desconhecida. Aos correspondentes açorianos são, portanto, pedidas imagens das peças e cópias dos artigos que, entretanto, Carreiro da Costa e José Agostinho tinham publicado nos periódicos *Açores* [15] e *A União* [16] respetivamente.

No artigo que depois publica, Fulford Williams reconhece a proveniência das peças dos Açores como da Catedral de Exeter e pertencentes ao bispo John Grandisson, apoiando-se nos contributos de R. S. Koehler e E. Pycroft e em várias outras evidências:

- No inventário dos paramentos da Catedral que John Grandisson fez logo no início do seu bispado (depois impresso por G. Oliver em 1506) figuram três casulas: 1) "Cum salutatione Beatae Mariae in dorso"; 2) com as armas dos Grandisson e as do rei Eduardo III; 3) com a Crucificação e dois anjos. Esta iconografia corresponde a peças existentes nos Açores (1 e 2 em Ponta Delgada e 3 em Angra).
- O bispo Grandisson foi responsável, durante o seu bispado, pela construção da maior parte da nave da catedral de Exeter e começou a fachada oeste, onde se localiza a pequena capela no lado sul da grande porta, onde foi enterrado. Durante a intervenção que aí foi efetuada em 1957, foi encontrado um anel de Grandisson, onde está gravada a representação de uma Virgem com o Menino muito semelhante à bordada numa das peças de Ponta Delgada e que apresenta, também, as suas armas de família.
- No manuscrito da *História de Exeter* (1590), John Hooker relata a visita dos comissários de Eduardo VI à catedral, em 1552, e de como levaram muitas peças em metais preciosos e paramentos sem que se saiba o seu destino ou localização posteriormente a isso.
- Por último, Edith Pycroft, relaciona a presença, nas peças de Ponta Delgada, das armas reais britânicas e das de John Grandisson com a visita triunfal a Exeter do Príncipe Eduardo, vencedor da batalha de Poitiers, em 1356.

Esta sucessão de contributos teóricos são o pretexto para que se apresentem várias iniciativas de classificação nunca concretizadas, da Câmara Municipal de Angra, em 1964 e 1969, e do Museu de Angra, em 1970, e que o próprio Victoria and Albert Museum, de Londres, se proponha efetuar o restauro das peças angrenses [17]. Não obstante, o assunto só será retomado na década de 1990, quando, depois de recolhidos no Museu de Angra do Heroísmo na sequência do sismo de 1980, os paramentos do Colégio são enviados, em outubro de 1991, para o Instituto José de Figueiredo, em Lisboa, de onde regressam em junho de 1997, quando dois novos contributos reequacionaram a questão da sua proveniência.

Conhecedor das peças de origem inglesa da Sé de Portalegre, que Luís Keil descrevera em 1941-43 [18], e da forma como haviam chegado àquela cidade alentejana, Emanuel Félix [19] equaciona a hipótese de, também as peças de Angra, terem origem "em diversas igrejas cismáticas e heréticas do reino de Inglaterra", diversidade confirmada e, aliás, ampliada na sequência do levantamento de paramentos bordados dos séculos XIV a XVI efetuado por Alarcão e Carvalho, quando se revelaram distintas proveniências geográficas e datações das peças angrenses, quer dos componentes de uma mesma peça (tecido de suporte e sebastos), quer das peças entre si, apontando latitudes que vão da Inglaterra à Flandres, e

cronologias do século XIV ao século XVI, confirmando a prática frequente do corte de peças e reaproveitamento de fragmentos e da sua aplicação sobre tecidos de suporte novos e de outras proveniências.

Estes contributos apontam que os sebastos bordados da casula amarela ou rosácea, do Colégio de Angra, demonstram uma aproximação estilística ao *Opus Anglicanum* –produzido nas oficinas inglesas nos séculos XIII e XIV e comum às peças de Ponta Delgada. A utilização do ponto fendido e do ponto de ouro estendido, a representação de elementos arquitetónicos de "transição entre a forma usada no século XV – um arco rebaixado e desenvolvimento de ramagens a partir de um nó central – e as arquiteturas de colunas robustas e duas aberturas no campo superior terminando em linhas acasteladas, que vão ser apanágio dos bordados ingleses do século XVI" [3, p. 103; 4, p. 25], além de figurações de asas muito recortadas e vestes trabalhadas em movimento ascensional, favorecem esta identificação.

Quanto à casula cor de vinho, ou carmesim, os sebastos aparentam ser flamengos e de uma época mais tardia. O trabalho a ponto de ouro matizado aplicado nas vestes, onde "os panejamentos são muito marcados e as pregas cortadas em ângulos bem definidos, a utilização de efeitos de relevo pelo recurso a cordões de enchimento" e, por fim, a característica composição arquitetónica das edículas constituída por colunas em dupla espiral, pequena esfera intermédia e capitéis envoltos em folhagem que desce de um arco central encimado por uma pequena torre saliente [3, p. 182], caracterizam-na.

As peças da igreja da Ribeirinha

Da casula em veludo com sebastos bordados e a respetiva estola pertencentes à Igreja Paroquial da Ribeirinha (Angra do Heroísmo – Ilha Terceira) desconhece-se quase tudo: a sua proveniência e datação, bem como a forma e a época da sua incorporação nos bens daquela igreja.

A sua existência é assinalada num levantamento efetuado pelo Museu de Angra, provavelmente na década de 1950, mas em que apenas é descrita a casula: "de veludo e brocado de linho bordado a ouro e matiz (paramento de origem inglesa). Século XIV" [20]. Depois disso, o museu associá-las-á às propostas de classificação dos bens do Colégio que apresenta na década de 1970, onde sugere tratar-se de "trabalho português ou italiano, e haver pertencido originariamente a uma das igrejas de Angra (Colégio dos Jesuítas ou Sé)" [21]. Apesar da falta de comprovação documental desta suposição, o que é certo é que os autos dos bens confiscados aos jesuítas na cidade de Angra, datado de 1765, referem a existência de paramentos bordados, assinalando que estavam na sacristia

> honze cazullas com estolas e manipollos correspondentes humas de damasco de ouro, outras de veludo com sebastos bordados, huma de galasse de prata, e todas gioarnessidas da mesma e ouro das quês sinco sam quazi novas [22].

O seu paradeiro atual é desconhecido mas a dispersão por outras igrejas da ilha não é despicienda a avaliar pela trajetória conhecida de outros bens deste colégio que, depois da extinção, foram entregues ao bispo da diocese, como os castiçais de prata datados e com a marca do doador – Alonso Cymbron – pertencentes à capela de Santa Teresa e atualmente na Sé Catedral são exemplo [2, p. 71]; da mesma forma, do Colégio de Ponta Delgada, também os paramentos bordados transitaram, de forma não documentada, para a igreja Matriz.

Só em artigo de 1996, Emanuel Félix [21] descreve as duas peças reafirmando como proveniência a Inglaterra, mas remetendo a datação para a segunda metade do século de quinhentos sem que para isso apresente argumentação justificativa. A sua preocupação centra-se na identificação dos personagens dos sebastos bordados que, desde a identificação inicial, haviam sido sujeitos a um processo de descoloração dos materiais e de perda de fios de preenchimento, processo que continuou até à atualidade e que é verificável a partir da comparação das imagens publicadas por Félix em 1996 e as atuais.

A casula em veludo cortado vermelho tem sebastos bordados sobre tecido amarelo aplicados na frente e costas

Figura 8. Casula da Igreja Paroquial da Ribeirinha – frente. Fotografia: MAH / Paulo Lobão.

(Figura 8); o bordado é executado a lâminas de metal douradas e prateadas e a ornamentação floral bordada a fio de seda (?) policromo. Os sebastos são delimitados por galão bordado enquanto todo o contorno da casula é debruado por faixa de tecido lavrado amarelo com tramas de lâmina metálica. Acompanhando o tecido lavrado, galão tecido franjado de cor vermelha com fio laminado de metal e, por fim, forro em cetim de seda (?) azul aplicado sobre suporte em tafetá de linho (?) castanho.

Ambos os sebastos apresentam tondos emoldurados por cordões entrelaçados com motivos vegetalistas e frutos, onde se destacam os cachos de uvas. Cartelas sob cada tondo teriam a designação bordada correspondente a cada figura. No sebasto frontal estão representados, de cima para baixo, os quatro Evangelistas:

- São Lucas (?): busto virado sobre o lado esquerdo, enverga veste ampla aberta à frente e o que parece ser o manto que lhe cobre a cabeça e o halo (?); do lado direito, como atributo, um livro aberto como se estivesse numa estante ou sobre um cavalete, e enquadrado por motivos fitomórficos.
- S. João (?): busto virado sobre o lado esquerdo apenas percebido no seu contorno, já que se localiza na zona de maior desgaste do sebasto, atravessada por dobras em que o fio do bordado desapareceu completamente; ainda assim, Félix identifica "a figura de um jovem que escreve ligeiramente debruçado sobre um livro".
- São Mateus (?): busto de frente, com a cabeça ligeiramente virada à esquerda e as mãos frente ao peito, repousando uma sobre um ramo; veste com mangas tufadas, cabeção sobre os ombros e o peito e gorro com dobra sob o halo de santidade. Do canto inferior esquerdo surge a figura de um jovem de perfil, segurando um livro aberto frente ao evangelista.
- São Marcos: busto de frente com a cabeça ligeiramente tombada sobre a esquerda; veste ampla em padrão riscado, com capa e cabeção; as mãos seguram o que parece ser uma folha de pergaminho desenrolada, e um tinteiro. A cabeça e a asa do leão alado que lhe serve de atributo, surgem à esquerda.

O sebasto das costas (Figura 9), em forma de cruz latina, repete o padrão decorativo do sebasto frontal e a mesma disposição de figuras em tondos, muito embora aquele colocado na interseção da cruz assuma um formato quadrilobado. A figura aí representada é a de Cristo, a única que surge de corpo inteiro, com uma veste de mangas largas e capa fechada no peito. Na mão esquerda suporta o globo terrestre do *Salvatori Mundi*, atribuição que se confirma pela legenda em que, em 1996, Félix informa ainda ter distinguido a palavra SALVATR. As outras figuradas representadas são, de cima para baixo, as seguintes:

- Monograma IHS circundado por raios flamejantes.
- Ladeando a representação de Cristo, no do lado esquerdo do observador, São Pedro em busto virado à direita e vestindo camisa e uma capa sobre o ombro esquerdo. Suporta na mão esquerda um livro e, na direita, uma chave; no lado direito o busto de São Paulo, virado sobre a esquerda e envolto numa capa debruada com fecho sobre o ombro direito; nas mãos tem um livro (porque apóstolo) e uma espada, atributo do seu martírio.
- Figura virada à esquerda segurando um livro e o que pode ser um bordão de peregrino (S. Jerónimo?) ou um chicote (S. Ambrósio)
- São Bartolomeu segurando na mão esquerda uma faca alusiva à sua morte por esfolamento.
- Arcanjo São Miguel em luta com o dragão que surge do lado esquerdo da extremidade inferior. O medalhão não apresenta o espaço da legenda depreendendo-se que foi cortado.

Figura 9. Casula da Igreja Paroquial da Ribeirinha – costas. Fotografia: MAH / Paulo Lobão.

A análise efetuada pelo Laboratório José de Figueiredo em 2016 [23] sustenta a cronologia quinhentista baseada na análise de tecidos, composições ornamentais e técnica empregues. Certo é que a representação dos evangelistas revela realismo anatómico e alguma fluidez dos panejamentos, enquanto o reportório decorativo é marcado pela inserção de tondos ao gosto renascentista; utiliza técnicas de fios laminados e cordões estendidos presos com pontos de seda com pouca densidade, e usa

fios laminados nos pormenores das representações humanas, deixando grandes áreas sem bordado e com o tecido de suporte à vista.

Apesar disto, a casula da Ribeirinha nunca foi objeto de proteção, classificação ou intervenção de conservação e restauro, permanecendo, aliás, no espaço de arrumação das restantes casulas da paróquia. Não deixa de ser curiosa, porém, a sua existência na igreja paroquial de uma freguesia rural constituída por volta de 1515: se bem que a mais próxima da cidade, é caracterizada, em meados do século XIX, como uma das freguesias mais pobres da ilha [24]. Sabe-se, porém, pelos registos dos livros de receitas e despesas ter a primitiva igreja sido acrescentada entre 1780 e 1787 [25], quando o templo já albergava cinco confrarias (Santíssimo Sacramento, Nossa Senhora da Conceição, Senhor Santo Cristo, S. Pedro e S. Antão – que em 1744 foram responsáveis pela aquisição de uma estante para o coro) e ainda as irmandades das Almas e de Nossa Senhora das Dores e a Ordem Terceira Franciscana.

Considerações finais

As casulas e respetivos manípulos e estola descritos são os únicos que ostentam sebastos bordados e que, até à data, foram identificados na ilha Terceira, enquanto em todo o arquipélago apenas se conhecem, além destes, os paramentos bordados da Matriz de Ponta Delgada.

O contributo dos meios laboratoriais para a sua descrição permitiu conhecer e estabelecer melhor a sua diversidade formal, técnica e estética e dispor de dados que contribuem para uma aproximação à determinação da sua filiação geográfica e cultural até aqui fixada com base em débeis argumentos documentais: tecidos de suporte em veludo cortado de origem ainda não determinada e sebastos bordados ingleses do final do século XV e flamengos do século XVI.

Se bem que no contexto medievo e tardo medieval da sua produção a encomenda e importação de peças a partir de centros produtores de excelência se constituísse como uma prática frequente para a composição do vestuário litúrgico das igrejas, para as peças angrenses apenas dispomos dos dados que nos confirmam a existência de casulas bordadas na igreja do extinto colégio jesuíta sem mais confirmação de eventual encomenda. Todavia, dada a importância catequética que as igrejas jesuítas desempenhavam nos Açores, tais peças mostrar-se-iam compatíveis com as peças de qualidade superior que compunham todo o reportório decorativo (sobretudo pintura e imaginária) da igreja, em parte importado e financiado pela elite angrense [2, pp. 61-65].

Apesar de só a continuação da pesquisa comparativa e arquivística poder vir a fazer surgir novos dados explicativos sobre a origem e a razão da presença destas peças em igrejas açorianas, o estabelecimento do percurso do seu reconhecimento e da patrimonialização de que foram sendo objeto impõe que se repensem as necessidades de proteção de bens tão frágeis como os que se materializam em suportes têxteis e que este artigo tem como objetivo central, dando-as a conhecer num âmbito mais alargado de especialistas.

Referências

1 Costa, S. G., 'A diocese de Angra: comemoração dos seus 475 anos', in *Tecer Relações. Paramentaria e Vivências Religiosas nos Açores,* Direção Regional da Cultura/Museu Carlos Machado, Ponta Delgada (2009) 19-23.

2 Leite, J. G. R., *Palácio dos Capitães Generais,* Presidência do Governo Regional dos Açores, Ponta Delgada (2012).

3 Alarcão, T.; Carvalho, J., *Imagens em Paramentos Bordados. Séculos XIV a XVI*, Instituto Português de Museus, Lisboa (1993).

4 Alarcão, T., 'As peças *opus anglicanum* da Igreja Matriz de Ponta Delgada' in *Tecer Relações. Paramentaria e Vivências Religiosas nos A*çores*,* Direção Regional da Cultura/Museu Carlos Machado, Ponta Delgada (2009) 25-28.

5 Afonso, J., 'De Londres para Angra. O Museu *Victoria and Albert* propõe-se restaurar os mais famosos paramentos existentes na Diocese', *Diário Insular* **7394** (1970) 1, 6.

6 'Relatório do estudo e tratamento de conservação e restauro de duas casulas pertencentes à Igreja do Colégio de Angra do Heroísmo', relatório de intervenção, Instituto José de Figueiredo, Lisboa (1997).

7 Fulford-Williams, H., *The Vestments of Bishop Grandisson Now in the Azores,* Devonshire Association, Essex (1962).

8 Ribeiro, I; Pedro, L., 'Recuperação de uma casula do século XV/XVI', *3.º* Encontro Vientífico do IPCR: Metodologias de Diagnóstico e Intervenção no Património, MC/IPCR, Lisboa (2003) 66-71.

9 Chaves, F. A., 'Paramentos religiosos do século XIV das egrejas, Matriz de Ponta Delgada, e do Collegio de Angra do Heroísmo', Revista *Micaelense* **3** (1919) 25.

10 Ataíde, L.B.L., *Notas sobre Arte,* Oficinas da Papelaria Micaelense, Ponta Delgada (1915).

11 'Extractos micaelenses', manuscritos, Biblioteca e Arquivo Regional de Ponta Delgada, Fundo Ernesto do Canto, vol. 3, 51-53.

12 Pycroft, E., 'The wanderings of a Bishop's vestments', *Guardian* (1908-1-7).

13 Pereira, G., 'Exposições', *Occidente* **18**(597) (1895) 163.

14 Ataíde, L. B. L., 'Novos subsídios para a Ethnographia e História da Arte Portugueza – A banqueta e as duas custódias do Muzeu da Matriz de Ponta Delgada', *Revista Michaelense* **2**(2) (1919) 179-183.

15 *Açores* **4924** (1961-11-9) 1, 5.

16 *A União* **19786** (1961-11-20) 1, 3.

17 *Diário Insular* **7394** (1970-12-24) 1.

18 Keil, L., *Inventário Artístico de Portugal. Distrito de Portalegre I*, Lisboa, Academia Nacional de Belas Artes (1943).

19 Félix, E., 'Paramentos antigos dos Açores: vestes sacerdotais inglesas dos séculos XIV e XV', *Atlântida* **37**(2) (1993) 7-28.

20 'Inventário artístico das igrejas da ilha Terceira (Paramentos, pratas e outras alfaias religiosas)', documento datilografado, Museu de Angra do Heroísmo, Angra do Heroísmo, Espólio Baptista de Lima.

21 Félix, E., 'Paramentos antigos dos Açores: casula do século XVI pertencente à Igreja Paroquial de São Pedro da Ribeirinha (ilha Terceira)'. *Atlântida* **42** (1996) 23-43.

22 *Documentos para a História da Arte em Portugal. 13. Arquivo do Tribunal de Contas. Colégios de Portalegre, Portimão,*

Faro, Angra, Ponta Delgada e Funchal (Companhia de Jesus), Fundação Calouste Gulbenkian, Lisboa (1973).

23 Monteiro, P., 'Parecer técnico', documento não publicado, DGPC – Laboratório José de Figueiredo, Lisboa (2016).

24 Drumond, F. F., *Apontamentos Topográficos, Politicos Civis e Eclesiásticos*, IHIT, Angra do Heroísmo (1990).

25 Merelim, P., *As 18 Paróquias de Angra,* 2ª edição, IHIT, Angra do Heroísmo (2017).

Recebido: 2018-7-3
Revisto: 2018-11-20
Aceite: 2018-12-14
Online: 2019-2-18

Estudos sobre têxteis históricos
Studies in historical textiles
A. Serrano, M. J. Ferreira, E. C. de Groot (ed.)

Intervention / Intervenção

An archaeological textile from the Monastery of Pombeiro: between conservation and perception

Marijke de Bruijne[1]
Paula Monteiro[2,*]

[1] *Independent textile conservator, Eindhoven, The Netherlands*
[2] *José Figueiredo Laboratory (LJF), Directorate General for Cultural Heritage (DGPC), Rua das Janelas Verdes 1249-018, Lisbon, Portugal*
**pmonteiro@dgpc.pt*

Abstract
Fragments of an archaeological textile were found in 2005 during the excavations of St. Mary Monastery of Pombeiro, Portugal. Investigation and conservation treatment took place in the textile department at José Figueiredo Laboratory (LJF) belonging to the Directorate General for Cultural Heritage (DGPC), in Lisbon. The textile is composed of several fragments. Despite the poor condition, metal threads are discernible. The purpose of this article is to reveal the mount, which was developed with a dual function: display and storage. Conserving the fragments and improving its appearance was a double target previously defined. The methodology employed requirements for conservation treatment and careful selection of materials will be disclosed.

Keywords
Archaeological textile
Mounting
Exhibition
Storage
Pattern

Têxtil arqueológico do Mosteiro de Pombeiro: entre a conservação e a perceção

Resumo
Durante as escavações, que decorreram em 2005, no Mosteiro de Santa Maria de Pombeiro, Portugal, foram encontrados fragmentos de um têxtil arqueológico. O estudo e o tratamento de conservação foram realizados no Laboratório José de Figueiredo (LJF), em Lisboa, sob a alçada da Direcção Geral do Património Cultural (DGPC). O têxtil é composto por vários fragmentos; apesar do mau estado de conservação, são visíveis fios metálicos. O objectivo deste artigo é divulgar o suporte de acondicionamento realizado com dupla função: exposição e reserva. Foi previamente definido um duplo objectivo que consistia em conservar os fragmentos e melhorar a sua perceção. É divulgada a metodologia empregue assim como os requisitos estipulados para o acondicionamento e a seleção criteriosa de materiais.

Palavras-chave
Têxtil arqueológico
Acondicionamento
Exposição
Reserva
Padrão

ISSN 2182-9942

Conservar Património **31** (2019) 203-214 | https://doi.org/10.14568/cp2018018
ARP - Associação Profissional de Conservadores-Restauradores de Portugal
http://revista.arp.org.pt

Introduction

In 2005 the archaeologist Dr. Ricardo Erasun Cortés discovered some textile fragments during the excavations in the St. Mary Monastery of Pombeiro (also called Monastery of Pombeiro) in the Municipality of Felgueiras, located 14 km South East of the town Guimarães in the North of Portugal. The monastery is one of the oldest institutions in Portugal, being first mentioned in the year 853 [1-2]. Based on the geological stratification layers in which the textile fragments were found, they can be dated back to the 16th century. Nothing is known about what kind of object the fragments originally were part of. Contemporary sources mention the burial of the nobility in the monastery, so maybe the fragments were part of costume or ecclesiastical vestments. Yet, there are many other possibilities, so this is purely hypothetical.

The object was carried to the textile department at José Figueiredo Laboratory (LJF) in Lisbon, for study purposes and treatment. In 2009 the fragments were investigated at the LJF in collaboration with the Faculty of Sciences and Technology (FCT NOVA), Campus of Caparica, by master student Joana Domingues [3].

In this article, the type of mount carried out for these archaeological fragments, the methodology, requirements for conservation treatment and the materials used will be described.

Object

The textile fragments consist of four bigger pieces of 11 cm long, between 2.5 and 9.5 cm wide and between 0.2 and 0.5 cm high. Furthermore, there are five little pieces having the largest 5 cm in length, 3 cm in wide to 0.6 cm high and the smallest 3 cm in lenght to 2 wide to 0.2 cm high, further a group of very tiny fragments (Figure 1). Though the fragments are small, it is possible to distinguish two different fabrics, composed of rich materials. The technical analysis allowed the fragments to be included in the category "textile bearing surface decoration" [4, p. 34]. The ground fabric is a silk lamé appliqued with a silk velvet, outlined with

Figure 1. Archaeological fragments of the St. Mary Monastery of Pombeiro, Felgueiras, Portugal. Photo: Jorge Horácio (LJF/DGPC).

couched cord of gilded silver threads. The lamé consists of two warps and three wefts. The mains warp and weft work in satin 5; the binding warp fixed the pattern weft in twill (3 tie 1) and the supplementary weft in twill (2 tie 2). This weft is composed of gilded silver strips wound around silk core. The velvet consists of two warps and one weft. The mains warp and weft work in twill (3 tie 1 with 6 threads), three picks to one rod. This cut velvet has a long pile which allows to be denominated *plush* [5, p. 39]. The twisted cord used for outlining consists in two separated strands, each one composed of five metal threads made up of gilded silver strips wound around a silk core.

The lamé was woven with silk threads and highlights the gilded silver threads on the surface, which would have made it a brilliantly shining weave. This lamé is decorated with applications of cut velvet with a long pile, edged with an applied cord of twisted gilded silver threads (Figure 2). In this archaeological textile, all the metal threads identified belong to the typology of "metal strip wound around a core of animal fibres yarn" [6], thus gilded silver strip, wrapped around a core of silk fibres [3, p. 6-8].

The stereo zoom microscopy Leica MZ 12.5, enlargement 100-200×, combined with photographic techniques (visible and X-ray) were fundamental for revealing that the applications were organized in a way to create stylised vegetal motifs; together they form a continuous pattern.

Condition

The colour of the object is unclear; the brown colour it has today is very typical for archaeological textiles and is probably not the original colour. The main reason for the discolouration of archaeological textiles is probably the immersion of the objects, which leads to the dissolution of the dyes [7]. No research has been executed into the original colours. The biggest fragments have a rectilinear sharp edge on one side (Figure 3). This edge looks like it has been cut. It is unclear when or why this is done.

The fragments are very fragile and brittle. The silk fibres break off and the fragments lose material easily when touched or moved.

Figure 2. Detail of a fragment, metal threads used as a cordon in applied decoration.

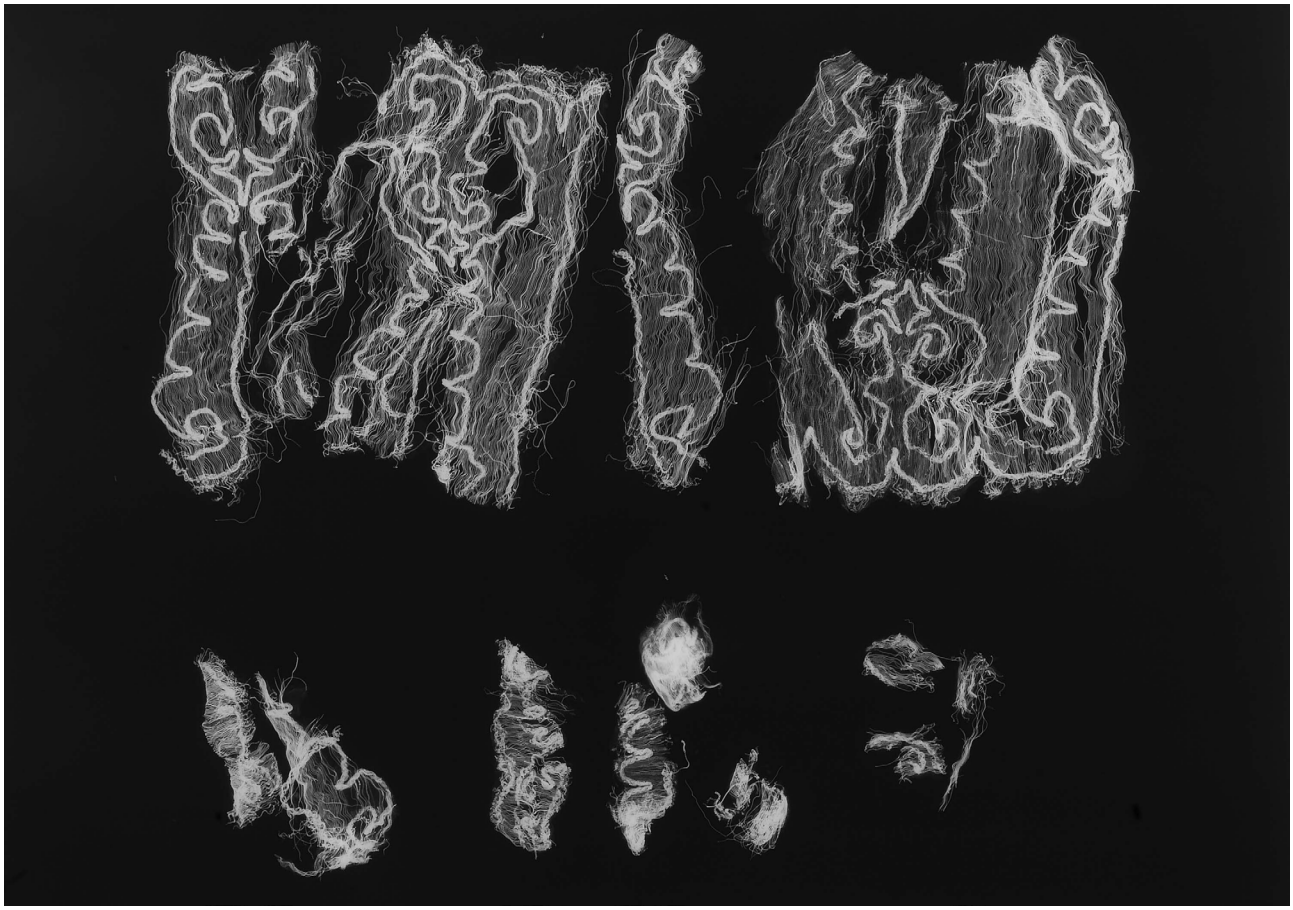


Figure 3. X-radiograph of the archaeological textile fragments. Photo: Jorge Horácio (LJF/DGPC).

It is not surprising that specifically the fragments with applications are the ones best preserved: this overlay layer make those fragments stronger. Though the metal threads of the lamé maintain some structure, the velvet applications were fundamental in preserving some of the stability, with its dense weave and its stitched contours.

In 2009 the fragments were cleaned with a micro vacuum cleaner, Bresciani micro aspirator, under a stereo zoom microscope, Leica MZ 12.5, enlargement 100-200×. The physical and chemical integrity of the fabric was not compromised during the cleaning treatment. The soiling accumulated in the interstices of the weaving could not be removed completely. The fragments still contain dirt, apparently layers of heavy soiling, also in the form of crystals lying loosely on the surface. For some fragments, a polyester film tents combined with the ultrasonic humidifier Esprit U1000 were used. The humidifying process allowed reducing some folds and the slow drying flattening gradually the fragments with the aid of stainless insect pins.

Finding the pattern

The applications with the contours of metal thread make a continuous pattern, which was clearly revealed by X-ray investigation, performed by the Photo Studio of LJF (Figure 3). Based on the X-radiograph, two main motifs, complementing each other, were identified. This allowed to present a proposal pattern and consequently to manage the organization of the fragments.

Conservation and perception

The textile fragments were extremely vulnerable. Furthermore, the lamé and the velvet which form a continous pattern are almost illegible. For those reasons it was desirable not only to stabilize the fragments, but also to make them more legible. A mount for the fragments had to be designed, for which the following set of objectives was formulated:

- stabilize the object;
- protect the object;
- respect the integrity of the object ;
- maintain study possibilities;
- no handling needed;
- display possibilities;
- legibility of the object;
- pleasing to the eye.

The goals and demands for the mount of the archaeological fragments were processed in a table (see Table 1). Every possible solution for a mount could be checked easily by using this table.

One more important thing had to be taken into consideration when designing a mount. After mounting, the fragments will be returned to the Monastery of Pombeiro. This is not a museum with an ideal environmental control system and professional heritage keepers, the main risks being: no stable climate, humidity fluctuations and no basic knowledge of textile collection care, resulting in careless handling of the object. This had to be kept in mind when designing the mount.

Objectives

For *stabilizing* and *protecting* the object, prevention of any movement in the object is pivotal. This could be obtained by creating a rigid, non-slippery support.

To respect the *integrity* of the object, any intervention into the object itself had to be avoided. Preserving the *integrity* of the fragments' three-dimensionality is of great importance.

To maintain *study possibilities* it was desirable to view the object from all sides and from very close by, without blurring the view or contact with the object.

To prevent direct *handling* of the object, the mount should be suitable not only for storage, but for display as well, and should allow the fragments to be moved easily and safely.

The *legibility* of the object means to clarify the object itself to the viewer, as well as the fabrics, the threads, the materials, the ornaments and the decorative patterns. It is unknown from what kind of object these fragments originate; however it would be interesting and informative to make the decorative pattern more visible and understandable to the viewer.

The objective that the mount must be *pleasing* to the eye is a somewhat difficult goal, because it is difficult to describe what is pleasant and what is not. However, a careful selection of the type and colours of the materials, based on the compatibility and reversibility, and an execution as neatly as possible, are essential in order to preserve and highlight the object.

Table 1
Evaluation of the goals for mounting of the archaeological textile fragments from the Monastery of Pombeiro

Goals	Resulting mount for the archaeological fragments
Rigid support, stabilizing	+
Protection	+
Integrity of the object	+
Handling of the object	+
Study possibilities	– /+
Display possibilities*	+
Legibility	+
Pleasing to the eye	+

+ Positive; – Negative

* The main fragments have limited study possibilities, but some tiny fragments are left behind for this purpose

Figure 4. The mounting proposals executed by Joana Domingues: fragment fixed with nylon net (left); fragment fixed with a grid of threads (right).

Designing the mount

For the mount design, earlier solutions for mounting archaeological fragments were studied, in particular:

- The first mounting proposal of two little fragments of the Monastery of Pombeiro by Domingues in 2009 [3, p. 13-14]. Both fragments were fixed in two different ways on a rigid support, covered with a linen fabric. One fragment was fixed with nylon net and the other with a grid of threads (Figure 4). Those solutions were not found satisfying: in the first case, the observation of the fragment is disturbed by the surrounding area, while in the second case the grid attachment does not confer stability and protection to the fragment.
- The mounting of a series of archaeological fragments from the tomb of archbishop Dom Gonçalo Pereira (†1384), belonging to the Tesouro – Museu da Sé de Braga (Portugal) [8]. Some of the fragments are on display in that museum. The mounting was found to be very satisfactory; it meets all the set goals. The objects lie loose in a cutout, hollow form which holds the object in place, without the need to fix it. A lid over the mount, in which the form of the object is also cut out, makes it possible to turn over the objects and see the object on both sides. The lid can be taken off and put on display. The objects are stable, the mount is suitable for storage and for display, the objects have good visibility and study possibilities and the mounts are very pleasing to the eye.

However, looking at the fragile condition of the fragments from the Monastery of Pombeiro, and also keeping in mind that the fragments will go back to the Monastery, where no professional caretaker is present, another solution had to be found for these fragments. The goal of stabilizing the fragments was found to have more priority than the goal to have optimum study possibilities. Thus, the possibility of manipulating the fragments to observe the reverse side was soon eliminated and a protection with nylon net would be inevitable and the appropriate solution to ensure the stability and protection of this textile.

All fragments were documented and photographed before, during and after treatment. The documentation is kept in the archives of LJF in Lisbon [9]. A study and treatment report is delivered to the proprietary together with the object, according to the rules established in LJF.

Build-up in layers

On the base of the set goals and with the examples in mind, a mount was designed for the textile fragments of the Monastery of Pombeiro, consisting of the following five layers (Figure 5):

- Prevention of any movement in the object could be obtained by creating a rigid support. This support is made of corrugated plastic sheet. This prevents movement and direct handling of the object.
- The rigid mount is covered with a soft layer of cotton flannel. The fragments are placed directly on the flannel. The flannel is soft and prevents sliding of the fragments.
- The fragments are fixed with nylon (polyamide) net. The nylon net will be fixed with stitches closely around the fragments. Not only does this fix the fragments, it also offers protection.
- A layer of nylon felt of 0.3 cm thickness, with the shapes of the fragments cut out. This protects the fragments all around. It also hides the nylon net around the fragments, thus making the nylon net less obvious. This layer is fixed with stitches on the flannel of the rigid mount.
- A second layer of nylon felt (0.3 cm), with not only the shapes of the fragments but also the pattern design cut out. This will make a suggestion of a continuous pattern around the fragments, which may clarify the pattern of the fragments to the viewer. This layer is made detachable by using cotton ribbons with Velcro on the four corners of the mount (Figure 5). This gives the opportunity to view and show the fragments also without the suggestion of the pattern design. The ribbons with Velcro can be fixed on the bottom side when this layer of felt is taken off. This will prevent the ribbons getting lost when the second layer of felt is not being used and it results in a kind of legs under the rigid support, which will elevate the mount slightly from the ground.

Execution of the mount

Selecting the materials

For the rigid support, a white sheet of corrugated polypropylene was chosen. This remains straight and with

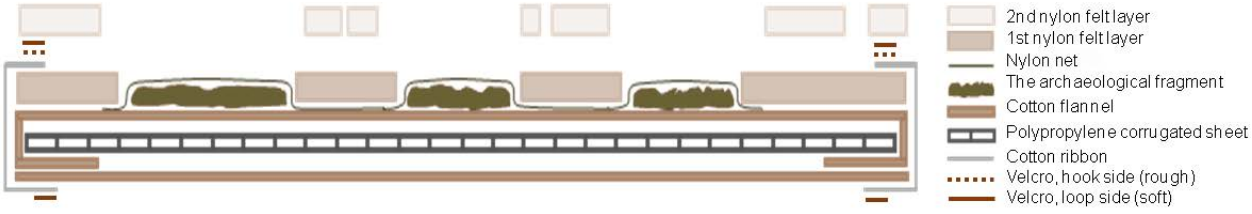


Figure 5. Scheme mounting profile.

Figure 6. Final arrangement of the fragments (in green pencil) on the pattern design.

the ability to repel water, it does not bend or get soft in moist conditions. For the cover of this support a sturdy white cotton flannel was chosen. A soft nylon (polyamide) net was used to cover and protect the fragments. A nylon felt of 0.3 cm thickness was chosen for the next two layers of the mount. Nylon is not susceptible to insect attack, which makes it a better choice than woollen felt. A cotton ribbon was used for attaching the second felt layer. For fixing the nylon net a silk thread was used. To make the stitches hardly visible, this proved to be the best option from the available materials. A stronger polyester thread was used for attaching the first felt layer to the mount. The goal was to assemble all the different materials using no adhesives, so needle stitching by hand was chosen. All materials needed were available in the textile department of LJF.

Dyeing the materials

First step in the execution of the mount was dyeing the materials. To establish the right colours, first some samples were dyed. On the base of this testing, the dye baths were prepared. The flannel was washed before with Lissapol, an anionic surfactant [6, p. 196]. The dyeing was executed with Dylon Textile Dye. Dylon is used in LJF for over 20 years for dyeing support materials and found to be stable over time.

The cotton flannel was coloured in a neutral beige colour, much lighter than the colour of the fragments, but not too contrasting. The nylon net was dyed dark brown, matching the colour of the fragments, to make the nylon net almost invisible when put over the fragments. The first layer of nylon felt was dyed beige, matching the colour of the flannel, as were the cotton ribbon for the Velcro and the silk threads for fixing the nylon net. The second layer of felt was dyed in a somewhat different colour, a light grey. Though a quite neutral colour in its own, this contrasts somewhat more with the fragments than the beige. All pieces of material were left overnight to dry.

Arranging the fragments on the reconstructed pattern

For the optimal arrangement of the fragments, the proposal pattern based of the X-ray, was used as a starting point. This reorganisation obviously contains details and deformations from the original textile fragments that were slightly attenuated to make the design straighter, symmetrical and *clean*. The two main motifs were drawn only once and arranged into a continuous pattern on a straight line, then traced on Melinex, resulting in a new clear pattern. This was fundamental to consider the organization of the fragments for the mounting.

Subsequently, the different fragments were arranged into this reconstructed pattern. It is not known how the different fragments originally were exactly placed in relation to each other; therefore, the arrangement of the fragments is just a proposal. Several arrangements were tried. The original fragments were not used for this, they are too fragile to be moved around; so, the forms of the fragments were traced on paper from the X-ray. The chosen arrangement was thought to make the pattern in the fragments most visible and clear (Figure 6).

Only the four larger fragments and one smaller fragment could be placed into the reconstructed pattern. For the four other small fragments, it was totally unclear from what part of the pattern they could originate; without references it was not possible to fit them into the pattern. So, it was decided to leave them out and make a second mount for the four remaining little fragments, without a reorganisation of the pattern around those fragments.

Rigid board and flannel

The rigid board of corrugated polypropylene was cut into the right size with an X-acto knife. The dimensions of the mount (20.5 cm × 44.5 cm) were defined according to the size occupied by the fragments, already organized in the pattern proposal. These dimensions were calculated to leave a frame around the fragments with the dimensions of 5 cm on top and bottom margin, and 6 and 7 cm for the left and right side margin, respectively.

The mount was covered with the cotton flannel, fixed on the back with double sided conservation tape of 1.9 cm wide. The corners were cut and sewn. The back was finished with the same flannel, sewn all around with an overhand stitch. All sewing was done with a curved needle and a beige polyester thread.

Cotton ribbons with Velcro

Before proceeding with the mounting and fixing of the fragments, four pieces of beige dyed cotton ribbon, of about 10 cm long, were fixed on the back of the mount. Their function is to hold the second layer of felt. Two pieces of Velcro were fixed on both ends of the ribbons with a sewing machine. To avoid hard pulling, very tiny pieces of Velcro were used. The end of the four ribbons with the loop side (soft) of the Velcro was sewn by hand on the back of the covered mount. An extra line was sewn where the ribbons can be folded back, to fit exactly when the ribbons are fixed on the back.

Mounting the fragments and fixing with nylon net

After deciding on the definite arrangement of the fragments in the pattern, the outlines of the original fragments were traced on Melinex, transferred to pattern paper, cut and integrated into the pattern design. This pattern design with the integrated fragments was used to make a new paper pattern in which the shapes of the fragments were cut out. This was used as a guide for arranging the fragments on the mount and afterwards for cutting the two layers of felt.

With the help of the paper pattern, the fragments were put exactly in place on the mount. Nylon net was placed over it and pinned temporarily (Figure 7). The nylon net

Figure 7. Pinning and sewing the nylon net around the fragments.

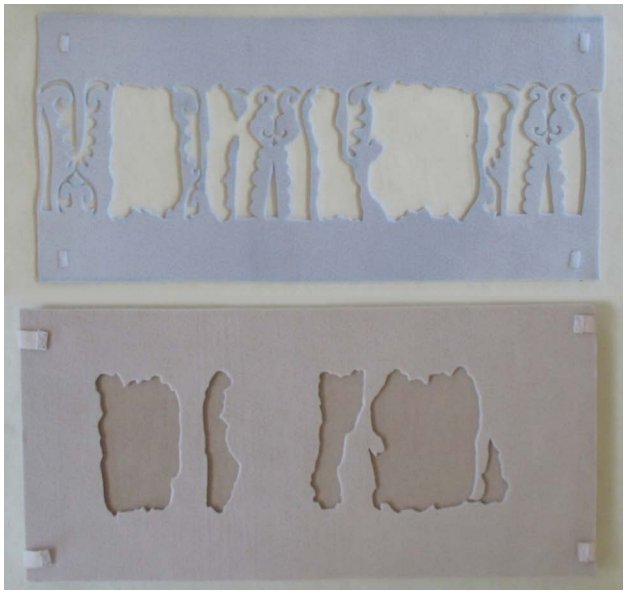


Figure 8. Attachment of the second layer of felt with Velcro.

was fixed in the flannel, closely around the fragments, with little backstitches. In *holes* in the fragments also some stitches were made, because it was necessary to hold the insecure fragments and also to pull the nylon net closely over the fragments. When nylon net is connected closely on the object, it is less visible. The nylon net was then cut, pinned and fixed all around with a running stitch.

After fixing the fragments the mount was vacuum cleaned around the fragments with a micro vacuum cleaner, to take away all loose particles that came of the fragments.

Felt layers with fragment shapes cut out

The two felt layers were cut into the size of the mount after covering the board with flannel, to make sure the sizes correspond exactly.

With the help of the paper pattern, the outlines of the fragments, arranged as decided, were copied on the two layers of felt, with a sewing pencil. This was done on the back, because it was not possible to remove the pencil traces completely. The cutting was executed with small sharp scissors. The shapes of the fragments were cut out of both layers of felt. The space required to prevent crushing or stressed fragments is created, but it also ensures protection by surrounding the fragments.

The first layer of felt was invisibly stitched around all sides on the flannel, with the beige polyester thread.

Felt layer with the proposal pattern

On the base of the proposal pattern, a second paper pattern was made in which the *pattern design* was cut out (Figure 8). This was used to cut out the second layer of felt, the grey one.

After cutting the pattern design out of the grey felt, it turned out that the felt was not rigid enough to maintain its stability. When put over the mount, partially loose parts had to be placed by hand. This was not satisfactory. To overcome this, it was decided to fix a piece of silk crepeline on the back of the felt. A silk crepeline of natural colour was dyed beige with Dylon Textile Dye to match the colours of the mount. The crepeline was cut away out around the fragments, not to obstruct the

Figure 9. The resulting mount without the proposal pattern. Photo: Jorge Horácio (LJF/DGPC).

Figure 10. The resulting mount with the removable proposal pattern. Photo: Jorge Horácio (LJF/DGPC).

view on the object. To deal with this fraying fabric, lines of 4 % Tylose MH 300 P (methyl hydroxyethyl cellulose) were applied with a small painting brush, following the outlines of the fragments. Cutting was done along these lines; the adhesive prevents fraying of the edges.

The crepeline was pinned and then stitched by hand on the back of the felt with white silk thread, following the shapes of the fragments and the design.

Four soft pieces of Velcro were sewn by hand on the back of the second layer of felt. This makes it possible to attach this layer of felt to the mount by means of the cotton ribbons with Velcro.

Other fragments

The four little fragments that had to be left out of the pattern proposal were fixed on a second mount in the same way, but without the second layer of felt. A left over from the dyeing was used for this purpose, which was a lighter shade of beige.

The very tiny fragments are not mounted, but kept aside in a little sachet of acid-free paper. They can be used for future study purposes.

Made-to-measure box

For the main mount, the second mount with the little fragments and the tiny fragments, a made-to-measure acid-free cardboard box with a lid will be made. This box shall have three compartments where each of the objects fits in exactly. This way the three objects will be kept together in a simple, but safe and nice way. A piece of acid-free paper will be added to cover the objects.

Result and discussion

The resulting mount for the archaeological fragments of the St. Mary Monastery of Pombeiro was found to be quite satisfying (Figures 9-10). Most of the goals set in the beginning of the project were reached (Table 1). The fragments are *stabilized* and *safely* stored, which was the main goal. The fragments are made more *legible* by revealing the pattern around it. This makes look closer for the continuation of the pattern in the fragments. The chosen materials and colours work well; the look and feel of the mount is good. Instead of looking dark, dull and dirty, the result looks *attractive*, fresh and pleasant. All this makes the mount very suitable for presentation. The mount offers several *display possibilities*: the main fragments can be shown with or without the proposal pattern and the little fragments may or may not be shown together with the main fragments. In addition to the above, the mount can be shown horizontally but can be raised for ease of viewing, never exceeding 45°, with no ill effect.

Some compromises had to be made in reaching the goals. Due to the extreme fragility of the fragments, and considering the circumstances where the fragments will be kept (in a monastery, not in a museum), it was decided to compromise on the *study possibilities*. The fragments are fixed under nylon net, so the detail examination must be executed through the nylon net and they cannot be studied on the reverse. However, study is still possible on the tiny fragments which are not mounted.

Fixing the fragments with the nylon net was a very rewarding task, because it was very clear that finally the fragile fragments were secured. No movement in the

Figure 11. The resulting mount profile with the several layers.

fragments is possible anymore, which will prevent more loss of material.

Function of the several layers

The various layers (Figure 11) have a function in stabilizing and protecting the object: the rigid mount prevents movement of the object; the flannel gives it a soft ground and at the same time avoids sliding of the fragments; the nylon net keeps the fragments fixed without intervention into the object itself, offers protection and prevents movement of the fragments. The first felt layer gives the fragments a soft protection all around, making them completely embedded in this layer. The materials and beige colours of the flannel and felt work well with the fragment: it is neutral, in a tint that is comparable to the object, it is not too dark and not too light. The first felt layer also helps to hide the nylon net, which is hardly visible and not experienced as an obstruction to the view on the object.

The detachable second layer of felt is revealing the pattern, but also gives extra protection to the fragments. Furthermore, this layer was designed to provide a new reading of this archaeological textile. The grey of this felt has a kind of lavender blueish shade. This colour works well with the fragments: it contrasts with the fragments without attracting too much attention and it looks as if the gold is shining more (Figure 12).

Some critical notes

In the second layer of felt, some problems in the execution were faced. Once cut, the felt turned out to be not rigid enough to maintain stability. Silk crepeline attached to the back did help to give it back some stability, and when put over the mount the crepeline is not visible. But it was difficult to attach the crepeline neatly to the felt, especially on the short edges of the mount, and it did cost a lot of time. Another solution would have been to fix the layer with stitches on the first layer, but then this layer would not have been detachable and thus presentation possibilities would have been limited. In retrospect this problem could have been prevented by keeping a frame of felt around the whole pattern design, not only on the top and lower side, but also on both lateral sides.

The arrangement of the fragments into the pattern is just a proposal; it is not known how the fragments originally were placed in relation to each other. It was not

Figure 12. Detail of the resulting mount.

possible to fit four of the little fragments into this pattern. Therefore, it was decided to leave them out of the pattern design and fix them on a separate mount, without the second layer of felt.

Conclusion

For the treatment of these archaeological fragments of the Monastery of Pombeiro, a double target was set beforehand: to conserve the object and to achieve better perception of the object. Both targets are achieved satisfactorily. The resulting mount optimizes the stabilization and protection of the fragments; it ensures the double function of storage and display and offers legibility of the decorative pattern of the object. All this is accomplished with respect to the integrity of the object. Compromises had to be done on the study possibilities, but by keeping the tiny fragments aside, study opportunities are ensured. The object can be returned safely to its keeper, the St. Mary Monastery of Pombeiro in Northern Portugal. So, the conditions to develop further studies of this fragment are created and a possible correlation with the other excavated objects, from the same archaeological stratification layer, would also be interesting.

Acknowledgments

In the whole process of thinking and reconsidering all wishes, problems and possible solutions, it was found very fruitful and indispensable to exchange ideas and work closely together with our colleagues. Therefore, we would like to thank the colleagues from LJF and especially Luis Pedro (conservation technician, LJF) and Madalena Serro (independent textile conservator), who both were always very willing to add to the discussion. The process of designing the mount therefore was a truly cooperative production. The authors wish to acknowledge Direção Regional de Cultura de Lisboa e Vale do Tejo and Direção Regional de Cultura do Norte, Portugal, for providing the opportunity to investigate and to perform the conservation intervention of the archaeological textile.

List of materials

- Polypropylene corrugated sheet (1 cm): Mitera, Agualva Cacém, Portugal
- White cotton flannel: Tecidos Santo Condestável, Lisboa, Portugal
- Nylon felt (0.3 cm): Nomalism, Lisboa, Portugal
- Nylon (polyamide) net: Dukeries Textiles & Fancy Goods Ltd , Nottingham, United Kingdom
- Silk crepeline: Whaleys (Bradford Ltd), Bradford, United Kingdom
- Cotton ribbon: Retrosaria Adriano Coelho, Lisboa, Portugal
- White Velcro: Retrosaria Adriano Coelho, Lisboa, Portugal
- Polyester thread Gütermann: Retrosaria Adriano Coelho, Lisboa, Portugal
- Silk thread: Pura Seda, pura-seda@homail.com, Vila Nova de Gaia, Portugal
- Dylon Textile Dye: http://www.dylon.nl
- Lissapol, anionic surfactant: SETA, Lda (extinct), Porto, Portugal
- Tylose (methyl hydroxyethyl cellulose): Preservation Equipment Lda, Norfolk, United Kingdom
- Conservation ATG Tape Permanent (double sided), pH7-70: R&C Restaurar & Conservar, Lisbon, Portugal http://www.restaurarconservar.com
- Melinex (polyester film, 100 micron): Preservation Equipment Ltd, Norfolk, United Kingdom
- Micro vacuum cleaner Muntz: Bresciani, Milano, Italy http://www.brescianisrl.it

References

1 'Mosteiro de Santa Maria de Pombeiro', in *Direcção Regonal da Cultura do Norte*, http://www.culturanorte.pt/pt/patrimonio/mosteiro-de-santa-maria-de-pombeiro/ (accessed 2018-5-14).

2 'Mosteiro de Pombeiro / Igreja do Mosteiro de Santa Maria de Pombeiro', in *Sistema de Informação para o Património Arquitetónico*, http://www.monumentos.pt/Site/APP_PagesUser/SIPA.aspx?id=4864 (accessed 2018-5-14).

3 Domingues, J., 'Estudo e intervenção de conservação e restauro – Fragmento arqueológico', relatório de Projecto II, Universidade Nova de Lisboa – Faculdade de Ciências e Tecnologia, Costa da Caparica, Departamento de Conservação e Restauro (2009).

4 Landi, S., *The Textile Conservator's Manual*, 2ed, Butterworth-Heinemann, Oxford (1992).

5 *Vocabulaire Français*, Centre International d'Étude des Textiles Anciens, Lyon (2005).

6 Tímár-Balászy, A.; Eastop, D., *Chemical Principles of Textile Conservation*, Butterworth-Heinemann, Oxford (1998).

7 Cybulska, M.; Maik, J., 'Archaeological textiles – A need for new methods of analysis and reconstruction', *Fibres & Textiles in Eastern Europe* **15**(5-6) (2007) 185-189.

8 Monteiro, P.; Serro, M.; Barbosa, F.; Carvalho, G., 'Urdir para acondicionar: Elaboração de suportes para os fragmentos têxteis pertencentes a Dom Gonçalo Pereira ', in *IX Jornadas da Arte e Ciência UCP – V Jornadas ARP. Homenagem a Luís Elias Casanovas. A Prática da Conservação Preventiva*, ed. R. C. Borges, E. Vieira & J. C. Frade, Universidade Católica Editora, Porto (2014) 151-164.

9 'Processo TO-1, processo de restauro n.º. 005/08', report, Laboratório José de Figueiredo, Lisboa.

Received: 2018-6-12
Revised: 2018-11-27
Accepted: 2019-1-15
Online: 2019-3-1

Normas para os autores

Princípios éticos
Tipos de manuscritos
Manuscritos
Referências bibliográficas
Declaração sobre as figuras
Direitos
Submissão dos manuscritos
Avaliação dos manuscritos

http://revista.arp.org.pt/pt/normas.html

Guidelines for authors

Ethical guidelines
Types of collaboration
Manuscripts
References
Statement about the figures
Rights
Submissions
Refereeing

http://revista.arp.org.pt/en/normas.html


Arp
Associação
Profissional
de Conservadores-Restauradores
de Portugal