Exploring Supplementary Methods for the Conservation of Lace.

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Abstract

Lace has a particular beauty. It is light and delicate and, even though it is now widely available, it is still viewed more as precious rather than as an everyday item. It is, therefore, surprising that the conservation of such objects has not received more attention in the conservation world. Existing conservation methods do not always compliment the structure of lace and can be non-sympathetic in respect of the texture and drape of the object.

This dissertation aims in some small way to address these issues. It looks at the resources available to conservators and the methods currently in use and suggests that the use of even the most rudimentary hand-skills, i.e. net-darning and bobbin lace making, would usefully supplement existing conservation methods. Furthermore, the use of a water-soluble sewing substrate is proposed as a suitable conservation method for guipure ground lace. These suggestions are supported by detailed case studies which of themselves are intended as an additional resource for lace conservators.

If this dissertation encourages some more textile conservators to learn how to make lace, in order to better equip themselves to conserve lace, it will have achieved its purpose.

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List of Acronyms

In order of appearance:

TCC	Textile Conservation Centre.
NMS	National Museums Scotland.
KFRC	Karen Finch Reference Collection.
CTC	Centre for Textile Conservation.
FTIR	Fourier Transform Infrared Spectroscopy.
MSDS	Material Safety Data Sheet.

Chapter 1 Introduction

The inspiration for this dissertation stemmed from my personal interest in lace making. I have been attending classes for the past four years, and have come to understand the basics of bobbin lace making and how both simple and complicated techniques are combined to make beautiful textiles. With first-hand experience, I can appreciate the time it takes to make a few centimetres of lace and, have developed a greater admiration for the craft and its practitioners.

The role of the conservator is to preserve the integrity of cultural heritage for the future. As Sheila Landi states,

> "The core of all conservation work lies in the object, and respect for the integrity of the object is of paramount importance if it is to maintain its value as evidence of social or technical history, or even its own unique beauty." [1]

The open-work nature of lace has proved a challenge to lace conservators thereby undermining the application of Landi's principles. The common choice of materials used to support lace are generally non-sympathetic sheer fabrics such as nylon, silk and cotton net, silk crepeline, and polyester Stabiltex®.[2] While these materials can be discrete and are used with good intentions, they do not always compliment the technical structure, fibre type, texture and drape of the lace. These factors ultimately affect how the lace is displayed and interpreted.

My research derives from Landi's statement outlined above, and aims to explore alternative methods to improve conservation standards for open-work lace so as to closely replicate the structure. Specifically, I propose that even a very basic knowledge of the hand-skills required to make lace would greatly enhance the conservator's tool-kit and assist them in ensuring that the integrity of the object under conservation is

[1] Sheila Landi, *The Textile Conservator's Manual – Second Edition* (Oxon: Butterworth-Heinemann, 1998), 4.
[2] Margaret T. Ordoñez and Annie-Beth E. Gross, "Repair of Twentieth-Century Leavers Lace," in *American Institute for Conservation of Historic and Artistic Works – The Textile Speciality Group Postprints, 40th Annual Meeting.* Vol 2 (2012):70-71.

maintained. In support of this argument, I will focus on two specific techniques for the treatment of net ground structure, namely net-darning and bobbin-lace patching, and will illustrate how knowledge of the techniques used to make the object significantly benefit the conservator in making choices to ensure the preservation of the core integrity and beauty of the object. Following extensive experimentation, I will further propose the use of a water-soluble sewing substrate as a suitable method for the conservation of guipure ground lace.

1.1 Research Aims

- To explore the methods applied to the conservation of lace in past and current practice;
- To suggest that, in certain cases, a restorative rather than a conservation approach may best preserve the true nature of lace while still following ethical conservation practice;
- To this end, to evaluate two proposed additional methods of lace conservation not in current use i) lace making hand-skills, and ii) water-soluble sewing substrates;
- To support the proposed additional methods by means of detailed case studies, thereby adding to the resource material available to lace conservators for future work;
- To supply the National Museums Scotland (NMS), and other lace collectors, with additional methods for the conservation of items under their care;
- To reawaken interest in, and demand for, lace making hand-skills.

1.2 Research Questions

1. What factors influence the decisions made by conservators when choosing support fabrics, and visual infills for lace objects?
2. Can conservation materials in current use be positively supplemented by basic lace making techniques and other hand skills?
3. Is water-soluble material viable for use in the conservation of lace?

1.3 Methodology

In pursuit of the above research aims and questions, this dissertation looks to explore additional methods for the conservation of lace by undertaking a literature review, circulating a questionnaire and undertaking a range of qualitative and quantitative analysis.

Chapter 2 looks at the core lace structures found in museum collections, specifically net ground and guipure lace structures often featured in bobbin and needle lace. Chapter 3 reviews published literature on the conservation of lace to evaluate the information and methodologies currently available to the conservator, highlighting any gaps in the field. Chapter 4 reviews unpublished accounts of the conservation of lace by assessing previous treatments recorded in the Textile Conservation Centre (TCC) archives. It also evaluates present-day responses received by questionnaire in the course of completing this dissertation. Both sources aim to review trends in methods and materials used, to understand the challenges and limitations experienced and the rationale behind the choices made, with a view to exploring supplementary methods. Chapter 5 introduces a case study focussing on damage to two lace collars from the collection of NMS together with two similar pieces of sacrificial lace from the Karen Finch Reference Collection (KFRC), University of Glasgow, on which various experimental methods have been tried and tested. This research aims to inform NMS, and others, of additional options for the conservation of their lace. Chapter 6 explores two possible approaches to the conservation of net structures using net-darning and bobbin lace making. Chapter 7 looks at the use of water-soluble sewing substrates for the conservation of guipure ground structures, identifies the material composition of four water-soluble

materials through Fourier Transform Infrared Spectroscopy (FTIR) and assesses their safety through Oddy testing. The material's solubility and pH-values are also tested. Chapter 8 puts one of the water-soluble materials into practice, investigates the presence of residue through microscopy and assesses its suitability for the conservation of guipure lace. Chapter 9 concludes the research and offers recommendations for these new methods of lace conservation and suggestions for further developments in this area.

Chapter 2 Lace

2.1 What is Lace?

The word 'lace' derives from the Latin, *laqueus,* which translates as a 'noose', being a hole formed or outlined by a rope or cord.[3] While lace is an ornate open-work fabric, not all ornate openwork fabrics are lace. The degree of open-work varies between styles to achieve a fine or heavy weight appearance.[4] Lace is made from the interworking of threads to form the overall pattern and fabric itself.[5] The pattern is made to include the ground-work, cloth-work and other decorative motifs.[6] See appendix I for a brief history of lace.

2.2 Identification of Lace

The origin of lace is very difficult to identify, and even more difficult to date. Unlike other textiles and works of art, lace very rarely exhibits makers or manufacturing marks to help assign its provenance.[7] There are infinite types and styles of lace. Some are very distinctive, and others bear many similarities to each other. The revival of styles throughout history also makes lace tremendously difficult to date and correctly identify. The term 'lace' is often used loosely when describing open-work textiles, however it is important to ask the primary question – "Is it lace?" As Pat Earnshaw reiterates, "All lace has holes in it, but not every textile with holes is lace."[8] Examining the identification of lace through its origin is beyond the scope of this dissertation. There are many literary sources dedicated to the topic. However, identification through technical structure will be explored in more detail. The technical structure of lace is of

[3] Pat Earnshaw, *The Identification of Lace* (Oxford: Shire Publications Ltd., 1994), 7.
[4] L.W. van der Meulen-Nulle, *Lace* (London: Merlin Press, 1963), 6.
[5] Heather Toomer, *European Laces: An Introduction* (Great Britain: Heather Toomer Antique Lace, 2002), 3.
[6] Heather Toomer, *Lace: A Guide to Identification of Old Lace Types and Techniques* (London: B.T. Batsford Ltd., 1989), 7.
[7] Toomer, *European Laces,* 4.

[8] Pat Earnshaw, *Bobbin & Needle Laces: Identification & Care* (London: B.T. Batsford Ltd., 1983), 12.

greater concern for the conservation of such intricate textiles. Identification through technique can be divided into major and minor categories based on the popularity of their making and use throughout Europe.[9]

Major:	Needle Lace	Bobbin Lace	Machine Lace
Minor:	Crochet Lace	Tatting	Chemical Lace

Bobbin lace and needle lace will be looked at in more detail as these are the most common types of lace found in private and museum collections.

2.3 Bobbin Lace

Bobbin lace describes lace made by looping, twisting, weaving, plaiting and knotting multiple threads.[10]

Bobbin lace is also known as 'pillow' lace, suggesting the firm pillow that the lace is worked on. It can also be referred to as 'bone' lace, which derives from the use of bone-made bobbins, and from the fish bones that were used as pins when the maker could not afford steel ones.[11] While bone is still in use today, bobbins are most commonly made from turned wood. Bobbins are used to store the thread, to provide tension, and to limit the handling of the thread itself. The style and shape of bobbins varies throughout Europe. The favoured type in the UK is the spangled bobbin, slender bobbins featuring beads, or spangles. Spangles are useful as they provide the bobbin with an anchor and stop them from rolling around and getting misplaced (Fig. 2.3.1).

[9] Listed are the main lace types per category. There are many more.
[10] Earnshaw, *The Identification of Lace,* 7.
[11] "Lace making in the time of Vermeer – Part 1," Essential Vermeer 2.0, http://www.essentialvermeer.com/lace/lace.html#.WSlhi2jyvIU (accessed May 27, 2017).

Fig. 2.3.1 Left: Turned wood bobbin, preferred type on continental Europe.

Right: Turned wood spangled bobbin, preferred type in the UK.

Bobbins are worked in pairs. Each pair shares a length of thread. The bobbins are worked down and from side to side, gradually working towards the maker; they are never worked away from the maker. Large or long pieces of bobbin lace can be made by working on a block pillow with moveable sections, or can feature a miniature bolster pillow to work lengths of lace (Fig. 2.3.2) overleaf.[12] Bobbin lace is worked using endless variations of the same stitches to achieve both simple and elaborate designs.[13]

[12] "Bobbin Lace," Deviant Art, http://lunarmoonlight.deviantart.com/art/Bobbin-lace-134429533 (accessed April 23, 2017).
[13] Van der Meulen-Nulle, *Lace,* 47.

Fig. 2.3.2 Bobbin lace pillow with bolster pillow inset.

There are two ways that bobbin lace can be made:

Continuous lace is worked on a 'pricking' using a set number of bobbins following detailed instructions.[14] The bobbins are moved in pairs working the various stitches. Pins are placed throughout the pricking to tension and to hold the shape of the lace (Fig. 2.3.3). The lace is worked creating the motifs and groundwork (background) together. Typical groundwork structures include a net ground and guipure ground (short plaited bars), or a combination of the two to connect the lace motifs.

Examples of continuous lace include: Flemish, Valenciennes, Mechlin, Binche, Chantilly, Blonde, Lille, Cluny, and Bedfordshire.

[14] 'Pricking' is the term used to describe the pattern featuring lines to imply the direction of the work between the dots that indicate the placement of pins which hold the lace in position and under tension when being worked.

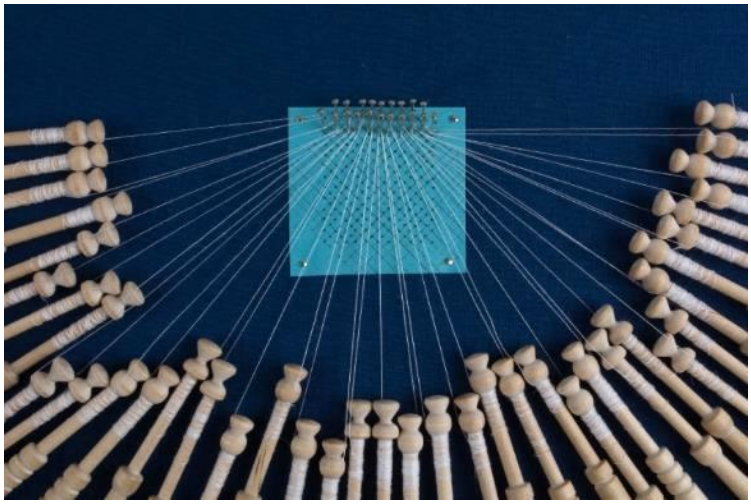


Fig. 2.3.3 Pins holding tension when working bobbin lace.

Non-continuous lace is also worked on a pricking using a fixed or flexible number of bobbins. The lines of the pattern are indicators only, and the maker is free to choose the placement of the pins. Decorative motifs are made independently of the groundwork. The ground is worked in afterwards using a separate set of bobbins to infill the area between the motifs. Typical groundwork structures also include net ground (hand or machine-made) and guipure ground, or a combination of the two.[15]

Examples of non-continuous lace include: Milanese, Brussels, Flemish, Flanders, and Honiton.[16]

2.4 Needle Lace

Needle lace describes lace made by working stitches using a needle and thread.

Needle lace is also known as 'needle point' lace, *point* being the French word for 'stitch'. *Punto* is the Spanish and Italian translation, both are seen in the traditional names of European laces such as 'point de Aleçon' and 'punto avorio'. Historically, needle lace was worked onto a linen substrate which was later replaced by a parchment 'pattern'.[17]

[15] It is important to note that some lace feature a combination of continuous and non-continuous lace.

[16] Van der Meulen-Nulle, *Lace,* 47.

[17] Clare Browne, *Lace from the Victorian and Albert Museum* (London: V&A Publications, 2004), 7.

Today, the pattern is commonly made from a card or an oiled cloth foundation. Like bobbin lace, this foundation can also be referred to as a 'pricking' (Fig. 2.4.1). [18,19]

Fig. 2.4.1 Working needle lace with a needle and thread onto card.

The pattern is outlined with a temporary support thread, and couched into position. The motifs are filled using buttonhole stitch. Unlike the several hundred variations of stitches used in bobbin lace, needle lace features fewer than 90 variations.[20]

Needle lace is primarily non-continuous, meaning the motifs are worked separately to the groundwork. The motifs are either linked with bars of thread strengthened by buttonhole stitches (guipure ground), or by working a loose buttonhole stitch mesh-ground. It is also common for needle lace motifs to be joined by bobbin or machine lace net ground.[21]

[18] "The Art of Alençon Needlepoint," UNESCO: Patrimonio Cultural in Material, http://www.unesco.org/culture/ich/es/RL/el-arte-del-encaje-de-aguja-de-alencon-00438 (accessed April 23, 2017).
[19] Toomer, *Lace*, 12.
[20] Earnshaw, *Bobbin & Needle Laces,* 92.
[21] Ibid.,99.

2.5 Materials

Historically, lace threads were made from organic fibres such as cotton, linen, wool and silk. These remain in use today. Inorganic metals such as gold and silver are also still used, but very occasionally. Other organic fibres historically used include banana and pineapple fibre, and horse and human hair. Comparatively little evidence of these laces have survived due to their less common use in everyday lace making.[22] Since the 20th Century, lace has also been made from man-made materials such as viscose rayon and nylon.[23] Materials have always accounted for significantly less than the cost of the finished product. The threads are worked and tensioned independently, therefore, it is imperative that the maker chooses good quality thread i.e., one that will not break easily under tension, and uses stainless-steel sewing needles and pins to prevent iron corrosion products from damaging the lace.[24]

2.6 Conclusion

Lace has remained a popular fashion and furnishing feature across all classes of society since its creation. Machine-made lace is globally produced today and feeds into the fashion and furnishing markets. Hand-made lace continues to be made in the home and as a cottage industry by skilled makers. It remains unique in its technical structure, and brilliant design. While it has experienced many declines and revivals throughout history, it has never lost its elegance, and the pleasure it brings to those who come face to face with its beauty. It is no surprise that so much lace has survived in both private and museum collections today. A serious consequence of the decline in makers is the decline in the hand-skills needed to preserve these valuable textiles for the future.

Both bobbin and needle lace feature a groundwork that visually and structurally infills the areas between the decorative motifs. Examination of historic lace shows that groundwork structures are the most vulnerable areas of lace and, in most cases, show the first signs of wear and tear. It is essential that conservators equip themselves with

[22] Mrs. F. Neville Jackson, *A History of Hand-Made Lace* (London: L. Upcott Gill, 1900).
[23] Pat Earnshaw, *Threads of Lace: From Source to Sink* (Guildford: Gorse Publications, 1989), 3-9.
[24] Browne, *Lace,* 9.

the knowledge to be able to differentiate between the basic structures, and employ the appropriate hand-skills for the various types of lace. The following chapter reviews published literature on the conservation of lace in order to assess the range of resources currently available to a conservator, and to evaluate and gain an understanding of the conservation of lace in past and current practice.

Chapter 3 Literature Review

3.1 Introduction

Literature on lace, whether from books, blogs, or websites is plentiful. It is mainly aimed at makers, collectors and admirers, focusing on history, identification, technique, and special collections. However, the purpose of this literature review is to look at sources relating to the conservation of lace, including those which refer to care and restoration. It aims to identify the scope and level of detail available and highlight any gaps in the literature that could be addressed when proposing new methods of conservation.

3.2 Sources

Firstly, the most prolific writer on lace, Pat Earnshaw is the only author to include the term 'care' in the title of one of her many publications, *Bobbin & Needle Laces: Identification & Care*, published in 1983.[25] Earnshaw shows an in-depth knowledge of conservation issues by describing the causes of degradation of fibres and acceleration of poor condition, and how to mitigate against such factors. While subsequent chapters cover cleaning and whitening, storage and display, she offers no guidelines for the structural or visual support of weak or damaged lace.

Heather Toomer includes a section called 'Cleaning, Care and Conservation' in her book *Lace – A Guide to Identification of Old Lace Types and Techniques*, published in 1989.[26] She begins by stating that "a detailed study of methods of conservation is beyond the scope of this book." She summarises the effects of acids and alkalis, and includes a detailed description of wet cleaning. However, with regard to supporting lace she states that "it is often safer and less unsightly to ignore tears and holes." Toomer justifies this by explaining that "a bad mend can do more harm than good," highlighting the risk of causing the fibres to split and break when pushing through a needle and thread.

[25] Earnshaw, *Bobbin & Needle Laces.*
[26] Toomer, Lace.

Contradicting this, she invites her audience to find literature on conservation for themselves or to seek advice from a conservator on how to carry out a repair.[27]

Written from a conservator's perspective, Sheila Landi's book entitled, *The Textile Conservator's Manual,* published in 1998, suggests possible methods of stitch support for lace.[28] Landi acknowledges that "whitework generally demands the very finest sewing techniques" and that "lace is very difficult to repair satisfactorily without modifying to some degree the effect of being suspended in air." Aimed at conservators, Landi suggests couching or darning lace onto a fine and transparent support fabric such as silk or polyester crepeline, or fine tulle (netting). She specifically suggests these methods for the conservation of net ground lace and includes some close-up before and after images to help visualise her recommended approach. Landi does not make any recommendations for the conservation of guipure ground structures.[29]

An example of a nylon net support on a guipure structure can be seen in a blog published by NMS. [30] The blog discusses the washing of a large guipure ground bobbin lace Alb, but it does not provide any rationale behind the choice of support material or stitching. Figure 3.2.1 shows nylon net structurally supporting the guipure lace, however, it appears out of place between the open-work of the guipure structure. In addition, the use of laid thread couching is visually distracting, and does not follow the direction of the design.

[27] Toomer, *Lace,* 188.

[28] Landi, *The Textile Conservator's Manual,* 138.

[29] 'Guipure' is the term used to describe lace motifs that are joined together with large stitches or bars; without the use of net or mesh.

[30] "Inside the Textiles Conservation Studio: How to wash Textile Objects," National Museums Scotland, http://blog.nms.ac.uk/2015/10/03/inside-the-textiles-conservation-studio-how-to-wash-textile-objects/ (accessed July 09, 2017).

Fig. 3.2.1 Nylon net visible between open-work of guipure ground.

Mrs. F. Nevill Jackson is unique in her approach to 'The Care of Lace' in *A History of Hand-Made Lace*.[31] Jackson presents a useful guide considering its early publication in 1900, before the conservation profession had been developed. She emphasises the need to establish the type of lace and explains that the groundwork often shows the first signs of damage. Comparable to a domestic manual, which includes guidance on cleaning and storage, Jackson concisely breaks down the types of mending possible under sub-headings. For example, 'To Mend Needle-made Lace with Bar Grounds,' and, 'To Mend Bobbin Laces with Bobbin Grounds.'[32] She emphasises the importance of choosing a mending technique matching the groundwork of the lace so as not to interfere with the natural appearance, technical structure, or interpretation of lace.

Thérèsa De Dillmont provides excellent written and visual instructions for the consolidation of net by darning under the topic of 'Embroidered Laces' in *Encyclopedia of Needlework*, first published in 1927.[33] She makes specific reference to the preservation of net, and the importance of choosing the correct weight of thread, and offers three diagrams to illustrate the technique. As a domestic needlework manual, she also includes basic instructions for washing, starching and pinning out lace.

[31] Jackson, *A History of Hand-made Lace.*
[32] Ibid., 81-93.
[33] Thérèsa De Dillmont, *Encyclopedia of Needlework,* (Editions Th. De Dillmont, 1927), 612.

Elizabeth M. Kurella is the only author to publish a book solely dedicated to the mending of lace in *Anybody Can Mend Lace and Linens,* published in 2001.[34] Considering its relatively recent publication, it is difficult to access its impact, and can only be bought or borrowed from the United States. Based on the tone of her writing, and her repeated reference to lace heirlooms, and vintage lace, her audience is presumed to be private owners, flea market and vintage shoppers who may wish to continue using and wearing their lace and who may not have any previous experience in sewing or restorative techniques. As she says, "If you can thread a needle, you can mend linens and lace." Kurella makes no reference to the conservation profession, or lace in museum collections.

Her approach focuses on planning the repairs, by looking and following the optical illusions of lace and considering line, space, texture and colour.[35] She offers her advice for a range of scenarios, e.g., what to consider when looking to restore, reverse, reconstruct, remodel, or recycle lace, and the consequences of those choices. Importantly, she asks the fundamental question, "is it worth fixing?"[36] This further supports the assumption that her audience are those wishing to use the lace rather than collect and preserve it.

Unlike Landi, Kurella makes more reference to the mending of guipure ground than net ground structures. She provides step by step photographs for a wide range of methods including 'reconnecting broken bars – of twisted threads, wrapped bars, braided bars, buttonhole stitch covered bars, and building a branching bar.'[37] Kurella does not offer any recommendations for the repair of guipure structures in areas beyond the connecting bars. Like Landi, she also recommends the use of net to stabilise and infill holes in net or mesh ground but does not go into further detail beyond choosing the right scale of net to use for supporting and infilling an area of loss.

[34] Elizabeth M. Kurella, *Anybody Can Mend Lace and Linens,* (Indiana: Elizabeth M. Kurella, 2001), 5.
[35] Kurella, *Anybody Can Mend Lace and Linens,* 6, 30-31.
[36] Ibid., 14.
[37] Ibid., 42-47.

The second half of her book is dedicated to short case studies, listing various types of damage and offering a wide range of solutions to mend them. She makes brief reference to lace darning, but unlike de Dillmont, does not provide instructions.

The most recent publication looks specifically at the *Repair of Twentieth Century Leavers Lace,* published in 2012.[38] The authors express their concern over the absence of resources which show how lace is machine-made to help configure a suitable method of repair. In line with the argument being made in this research, the authors emphasise that "the construction of machine-made laces must be identified, studied, and mimicked as closely as possible to disguise the repair of the lace." However, they appear to think that this argument only applies to machine-made lace, and that standard methods of conservation using net or sheer fabric remains acceptable for hand-made lace.[39]

3.3 Conclusion

All publications discussed have something to offer to the field of conservation. Kurella's publication, while not specific to conservation, provides the reader with the widest range of creative techniques going beyond machine and hand-made lace to include filet lace and cutwork. Kurella's book should be considered as a first point of reference for present day conservators. However, with very similar information cropping up across these few publications, it is clear that there is a need to expand the field of research to develop new techniques and new references.

Throughout these publications, the terms 'mend', 'fix' and 'restore' are more common than the term 'conserve.' This was expected, as the conservation profession stems from the restoration profession, and the hand-skills and techniques that it developed. [40] Corfield states that "conservation is the means by which the true nature of an object is

[38] Ordoñez and Gross, "Repair of Twentieth-Century Leavers Lace," 71.
[39] Ibid., 72.
[40] Mary Brooks, Caroline Clark, Dinah Eastop and Carla Petshek, "Restoration *And* Conservation – Issues for Conservators: A Textile Conservation Perspective," in *Restoration. Is It Acceptable? British Museum Conference.* Ed. Andrew Oddy. London (1994):105.

preserved."[41] It is understood that "conservators tend not to introduce designs back into missing areas and use instead neutral or coloured support materials."[42] However, with regard to open-work textiles like lace, support fabrics in common use can deny the true nature of lace and it may be that a restorative approach may prove to preserve the true nature of lace better than standard conservation approaches while still maintaining an ethical stance on conservation such as the importance of reversibility, so called 'ethical restoration.'[43]

In looking deeper into this topic, the following chapter reviews past conservation treatments and evaluates responses received from a questionnaire. The aim is to understand the rationale for decisions made in the past and to assess the limitations of conservation practice with a view to answering the first research question, 'What factors influence the decisions made by conservators when choosing a support fabric and visual infills for lace objects?'

[41]M. Corfield, "Towards a Conservation Profession," in *Preprints for the UKOC 30th Anniversary Conference,* London (1998): 4
[42] Mary Brooks et al. "Restoration *and* Conservation – Issues for Conservators: A Textile Conservation Perspective," 107.
[43] Ibid., 110.

Chapter 4 A Review of the Conservation of Lace in Past and Current Practice

4.1 Introduction

Following the review of published literature in the preceding chapter, this chapter reviews unpublished case histories on the conservation of lace. Section 4.2 reviews past treatment reports from the TCC. Section 4.3 reviews responses received from a questionnaire circulated amongst current practicing textile conservators, while section 4.4 concludes with findings relating to the first research question. It is intended that the information gathered will be used to evaluate techniques in past and current use, and provide scope for exploring supplementary methods for the conservation of lace.

4.2 The Conservation of Lace in Past Practice – A Review of Written Documentation

A total of eleven documents were reviewed from the archive of the TCC dating between 1991–2007. Of the eleven sources, only six made specific reference to the structural support of lace. Four documents were accessed through the archives at the University of Glasgow; and the remaining two, also at the University of Glasgow, were digitally available at the CTC. While digital images accompanied the two documents held at the CTC, there were no images accompanying the reports at the TCC archives, and therefore it was necessary to rely solely on the written descriptions provided. Five documents described damage to the net ground and only one document described damage to guipure ground.

1. The conservation report of a white cotton needlework wedding veil (TCC. 1523, dated 1991) described the use of nylon net to support the area of net ground lace that connects to the veil's headband. There was no reference to the type of thread used. Previous repairs remained in situ in other areas; these included the sewing together of lace motifs and the use of silk net to support the bottom edge.

2. The conservation report of a lace christening robe, (TCC. 1841, dated 1993) described the use of "a darning technique" on a net ground featuring eight holes. The author referred to the use of fine lace cotton thread used for the darning. The author also stated that "some loose threads in the neck and chest area were drawn to the inside and needle-woven back into the fabric of the dress where possible," and that "several loose previous repair threads were removed to allow the darning technique to be carried out."

3. The treatment proposal for a lace wedding veil (TCC. 2056, dated 1994) described a previous repair, referring to the mounting of the wedding veil onto fine silk, and supporting with net around the edges. The author scrutinised the previous repair and implied its unsuitability by proposing that "further research should be undertaken to find a suitable type of replacement net." The client was offered three options of treatment, with different levels of intervention.

4. The conservation report of a lace dress (TCC. 2482, dated 1995) described the replacement and repair of missing and broken connecting bars "supported using three strands of a nine-ply cotton thread of suitable colour, following the method originally used." The conservation report did not specify the method used to make the original connecting bars, or the type of stitch used.

5. The conservation report of a lace wedding veil (TCC. 2863, dated 2005) followed a more structured document format and provided significantly more detail than other reports. The author referred to three large areas of damage previously stitched closed, and stated that the client requested the lace to be "repaired and stabilised for storage and possible further use." The author also stated that the veil was fully supported using monofilament nylon net secured with conservation stitching, using monofilament silk thread. The term "conservation stitching" was not elaborated upon; however, the corresponding digital images suggested the use of running stitch. The author also applied an additional layer of net to the front of the veil in vulnerable areas. Reviewing the treatment, they stated that "the net support has reunited the fragments and the main part of

the veil making the object visually complete again." Regardless of its 'complete' condition, the images of the treatment showed the repairs as being obvious and distracting against the dark background. The dark background was chosen specifically to show the repairs, assuming they would be less obvious against a lighter background. The full and extra support applied to the wedding veil appeared to affect the lightness and delicacy of the object, which may have affected the drape of the veil when worn.

6. The conservation report of a lace shawl (TCC. 2992.2, dated 2007) described the use of nylon net to support eighty-two areas of loss and weakness in the net ground. Silk monofilament thread was used for stitching the supports into place. The areas of loss in the lace shawl were supported using patches as opposed to a full support. "The patches were cut as close to the stitching and floral design as possible to help disguise the patches and not disrupt the visual aesthetic of the lace." The author acknowledged that the visual aesthetics was an important factor in the treatment. The use of patches created localised shadowing. Close-up images illustrated the object as having a diamond shaped net ground structure, whereas the nylon net support was hexagonal. The layering of the different structures appeared to cause the shadowing effect. From a distance, the fineness of the nylon net made the support almost invisible against a light background. However, the fineness of the support did not provide the area of damage with an accurate visual infill.

4.3 The Conservation of Lace in Current Practice - A Summary of Questionnaire Responses

The following is a summary of responses yielded from a questionnaire circulated among practicing conservators from the UK and abroad. Forty-seven conservators were approached, with a response rate of 36%. A total of seventeen responses were received, described as follows: England (6), Scotland (5), Ireland (1), Spain (1), United States of America (3), and Mexico (1). Each contributor was asked to reflect upon their experience of conserving a piece of lace. Most offered one or two case histories while others offered a general overview of their experiences. The questions specifically focused on the structural support and aesthetic considerations taken into account by the surveyed in order to establish their rationale and methodology. See appendix II for full transcripts of each response.

1. Please state your place of work?
    a. Private Practice. 5
    b. Public Institution. 11
    c. Other. 1

2. Please describe the object, stating the type and/or origin of lace if known.

Types of objects ranged between two and three-dimensional pieces; mainly costume and accessories, e.g. a christening robe with a lace overdress. Objects dated from the 17th-20th Century.

The type of lace was identified by most contributors, indicating whether the piece was bobbin, needle or machine-made; however, the term origin was interpreted differently. Contributor 17 (C. 17) was the only conservator to offer the origin in terms of identification as being either Maltese or Cluny lace. Others could offer significant provenance details such as "17th C bobbin lace bertha from the effigy of Mary II – Westminster Abby." (C. 16)

3. Please provide the approximate date of treatment.

Those who offered specific case studies did so by reflecting upon their most recent treatment carried out, dating from 1985 to the present day. Nine of the seventeen responses discussed treatments carried out in the last eighteen months (2016-2017).

4. Please describe the type(s) of structural damage/loss. E.g. holes/tear in net ground/densely worked motif.

Most contributors described the types of structural damage or loss as being tears, holes, minor losses, and distortion. Most damage was in the net ground. One contributor described the pulling and unravelling of threads in a lace motif (C. 14). Another contributor referred to "broken connecting bars" of a guipure ground (C. 16).

5. Please describe the main aims of the treatment.

The consensus was to physically stabilise, support, reshape, and improve aesthetic appearance. Contributor 16 described their aim as providing an "aesthetic infill for areas of loss." Many contributors stated that the treatment was carried out to make safe for future storage, or mount for exhibition display on a padded board, or mannequin. Contributor 15 described their treatment as being for future use.

6. Please describe the type of support treatment and material(s) used for the consolidation of damage/loss.

Six contributors described the use of nylon net, also referred to as 'conservation net' and 'nylon bobbin net' (C. 5,6,9,10,11,16). Contributor 6 reflected upon "trying to match the shape of the net to best match support." Two contributors described the use of supporting areas of damage/weakness with silk crepeline (C. 2,17).

Monofilament or hair silk was the most commonly used thread. Some used threads pulled from polyester Stabiltex®, fine cotton thread and Polyester Mara 220.

7. Please describe the rationale for your choice of treatment and material(s).

Contributor 10 described their rationale for using a nylon net overlay as a quick solution. Their choice of treatment and material aimed to "provide fast, straightforward and visually unobtrusive support in a narrow time frame." The availability and ease of

working with nylon net was noted as the main rationale for Contributor 1, with the addition of time available for the treatment, noted by Contributor 16. Contributor 14 described their use of nylon net as being "aesthetically the best option and mechanically strong enough."

Contributor 2 acknowledged that nylon net was stiff, but had the advantage of not fraying when cut. Contributor 17 believed that nylon net was too abrasive, using silk crepeline as a support instead. Contributor 11 was the only conservator to take drape into consideration, explaining that nylon net "was a relatively close match for the ground net of the machine lace. It also allowed for drape and movement."

Contributor 14 offered their rationale of using silk thread "as it was strong enough but not sharp as the net and lace were really worn and could have broken with the use of a Skala thread." Contributor 17 refers to threads pulled from polyester Stabiltex® as being a good alternative to the silk thread used, but Skala would have been too thick for the repair.

8. Did you explore any alternative treatment(s) before choosing the method used? If yes, please outline alternative method(s) tested. If no, please outline your reason(s) for not exploring alternative treatment methods.

All contributors answered "no" to this question. Contributor 14 indicated that they believed their choice of nylon net was the best option, stating, "I don't think any other support material would have worked well with this object."

The main reasons for not exploring alternative treatments was due to the availability of materials and time limitations (C. 1, 2, 3, 10, 13, 16). Contributor 16 acknowledged that any alternative treatment was out of their comfort zone by declaring, "Lace making/restoration techniques were not considered due to the fineness of the lace, the quantity of damage, my lack of lace-making ability and time allocated."

9. Was the type and/or origin of lace considered an important factor when choosing the support treatment and materials? Please elaborate.

Most contributors responded “yes” to this question, specifying that the structure of lace was considered an important factor, but the origin of lace was not. Contributor 2 said, “Research was done to identify and learn about the origin of lace, however, in the end, it did not seem to influence the choice of conservation treatment.” Contributor 15 said, “The same techniques (and thus structure) are used in different periods and places so the problems tend to be similar no matter what the object's origins. Choice of support method focused on type, i.e. structure.”

Three contributors referred to the right choice of material to match the lace as a deciding factor for the treatment. Contributor 6 said, “As far as possible, the main consideration was to match the scale and size of the base net of the lace regardless of any other pattern or decoration.”

10. Do you or have you ever made lace? If yes, please provide details. If no, why not?

Five contributors responded “no” to this question, some stating “I don’t have the time” (C.1), “Seems very complicated and time consuming” (C. 4), and “The technique does not appeal to me” (C. 5).

Eleven contributors responded “yes,” five claimed to have learnt the basics as part of their conservation training. Contributor 15 maintains that learning bobbin and needle lace has helped them to understand lace structures, and “how they behave and exhibit damage, and thus how (my) support stitching should integrate with the original.” In contrast to this, Contributor 2 expressed that learning lace making is “enlightening in terms of understanding structure but not essential for conservation of a lace object.”

11. Upon reflection, is there any aspect of the treatment that you would have done differently today?

Most contributors responded “no” to this question. Contributor 16 stated, “I would be interested to know other support methods as it seems there are a few more successful alternatives to this at present,” referring to their treatment using nylon net.

12. Please provide any further information you wish to add regarding the conservation treatment.

Two contributors chose to include additional comments based on their personal experiences. Contributor 4 said, “Lace conservation can be tricky, especially to match the substrate with the lace whilst keeping a sense of aesthetic value.” Contributor 5 said, “The treatments are not always visually ideal but the best possible with materials and time available.”

4.4 Conclusion

To answer the first research question, it is clear that time and resources are the biggest factors influencing the decisions made by conservators when choosing a support fabric and visual infill for lace. Not enough time was made available for conservators to explore alternative methods. Also, as there is a noticeable absence of literature on the subject of lace conservation conservators appear to rely heavily on the same methodology for most treatments.

From reviewing both types of unpublished sources, the most common type of structural damage occurs in the net ground. Therefore, it is no surprise that nylon net is the primary material used by conservators today. However, looking back on older treatments, TCC. 1841 describes using a darning technique to support a net ground. TCC. 2482 describes bridging the connecting bars of a guipure ground using embroidery thread, whereas Contributor 16 describes using nylon net to support the same kind of ground. One questions if the lack of time and absence of resource material have contributed to these basic methods of support falling out of current practice.

Chapter 5 Exploring Supplementary Methods for the Conservation of Lace

Following a review of both the published and unpublished sources outlined in the preceding chapters, a study visit to NMS was carried out to assess the types of damage typically present on historic lace, and to review past conservation treatments. Two lace collars were chosen forming the focus of the investigation into new methods of conservation (Fig. 5.1 and 5.3). These objects were chosen due to their similar function but different ground structures, and therefore require different treatments. One featured damage to the net ground (NMS Lace Collar A) the other to the guipure ground (NMS Lace Collar B). Both types of damage reflect the types of damage most commonly referred to in chapters 3 and 4.

Fine cotton threads were fractured resulting in eight small holes in the net ground of NMS Lace Collar A. These were most likely caused from wear and/or overzealous handling. One large hole can be found to the back of NMS Lace Collar B. This hole appears to have occurred from severe mechanical force. The fracturing of threads has resulted in the distortion and unravelling of threads around the areas of damage in both collars. Due to their contrasting ground structures, their conservation must be approached differently to preserve the integrity of each object as accurately as possible. See appendix III for object and condition reports of each collar.

While the methods reviewed in past and current practice appear to structurally stabilise the areas of damage, they do not always match the technical structure of the lace. As investigation into supplementary methods of conservation was not permitted by NMS for use on the collars in their collection, two similar pieces of sacrificial lace were chosen from the KFRC (Fig. 5.2 and 5.4) overleaf. Similar damage was imposed on these pieces to help explore new methods of conservation. The overall aim was to compare the visual aesthetics and technical structure of supplementary methods proposed with those in past and current practice. By evaluating the advantages and disadvantages of each method, it is hoped to inform NMS and other holders of lace

collections of possible additional methods of conservation for lace in their collection for the future.

Fig. 5.1 NMS Lace Piece A detail.

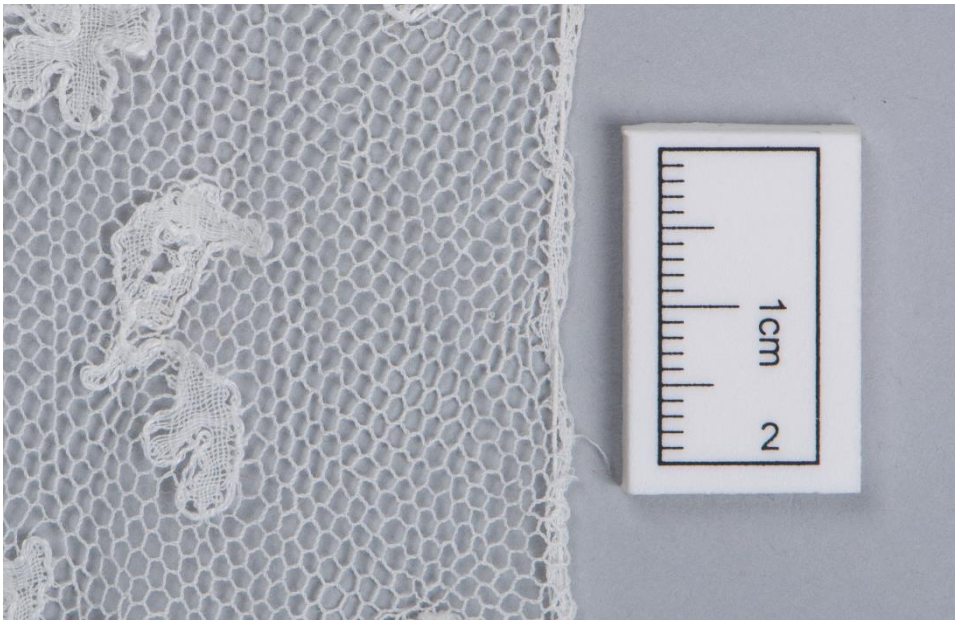


Fig. 5.2 KFRC Lace Piece A detail.

Fig. 5.3 NMS Lace Piece B detail.

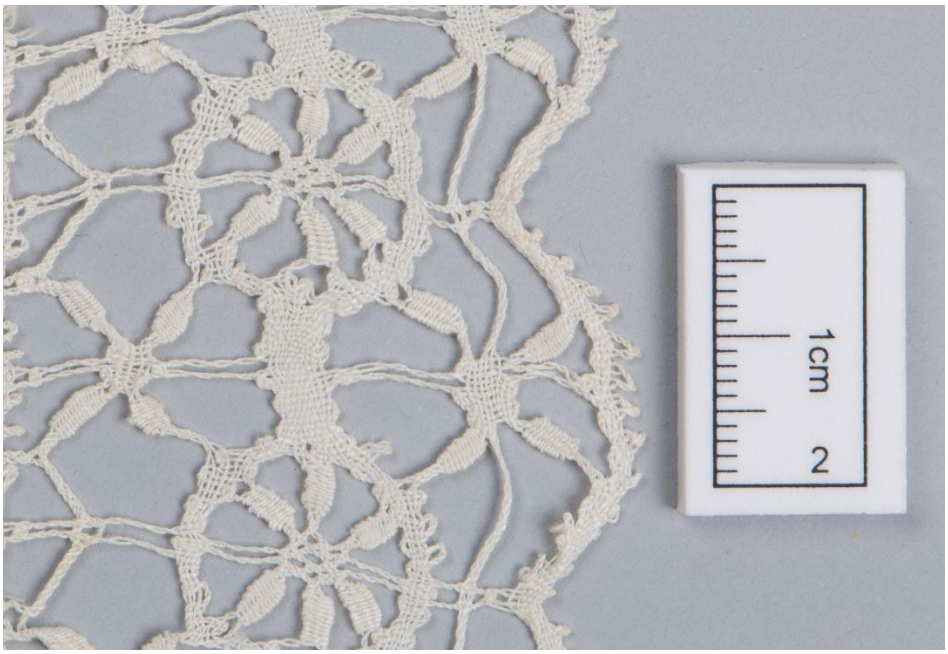


Fig. 5.4 KFRC Lace Piece B detail.

Chapter 6 Evaluation of Conservation Methods for KFRC Lace Piece A

6.1 Introduction

The work on KFRC Lace Piece A was completed in two stages, firstly, using net daring to repair the net ground. This was followed by the making of a lace patch. These procedures are detailed in section 6.2 and 6.3. Net darning works by integrating a support structure through the lace itself, whereas basic bobbin lace making can be used to create a patch. By choosing the same fibre type, weight and colour thread, both techniques should support an area of weakness or damage, and infill an area of loss. They should not interfere with the interpretation, nor should they affect the natural drape of the lace.

Through imagery, section 6.4 evaluates the effectiveness of both methods when applied to KFRC Lace Piece A and compares them to methods in common practice, such as support using nylon net. Qualitative results are tabulated. Section 6.5 concludes the evaluation with a view to answering the second research question, 'Can conservation materials in current practice be positively supplemented by lace making techniques and other hand skills?'

6.2 Net Darning

An area of damage on the net ground of KFRC Lace Piece A was darned following instructions outlined by Thérèsa De Dillmont, in *Encyclodedia of Needlework* with some modifications. Extra fine Egyptian cotton thread (175/2) and a fine curved needle was used to carry out the technique. The lace was pinned out onto a fabric covered polystyrene block. The net ground was darned in three directions beyond the area of loss as illustrated in Figures 6.2.1-6.2.4. De Dillmont states that "the method is the same for coarse and fine net."[44]

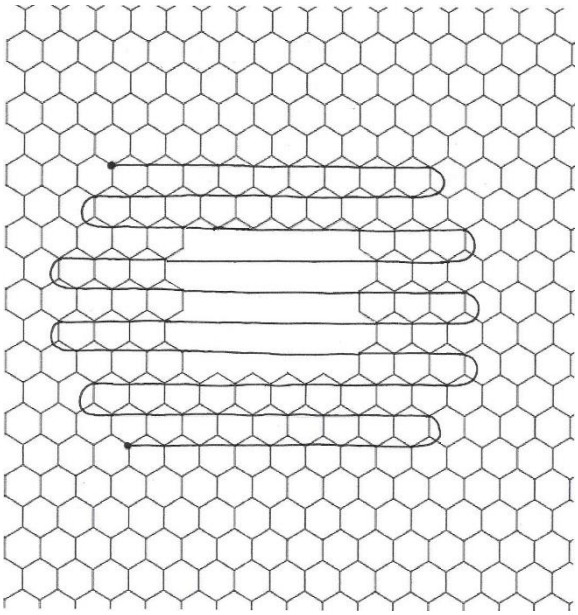


Fig. 6.2.1 Net darning stage 1.

This first stage consists of stretching the thread across the net horizontally, securing the thread by wrapping it through the existing net as illustrated in Fig 6.2.2. It was found that the tension of this first step was critical, as it formed the backbone to stages 2 and 3.

[44] De Dillmont, *Encyclopedia of Needlework,* 610.

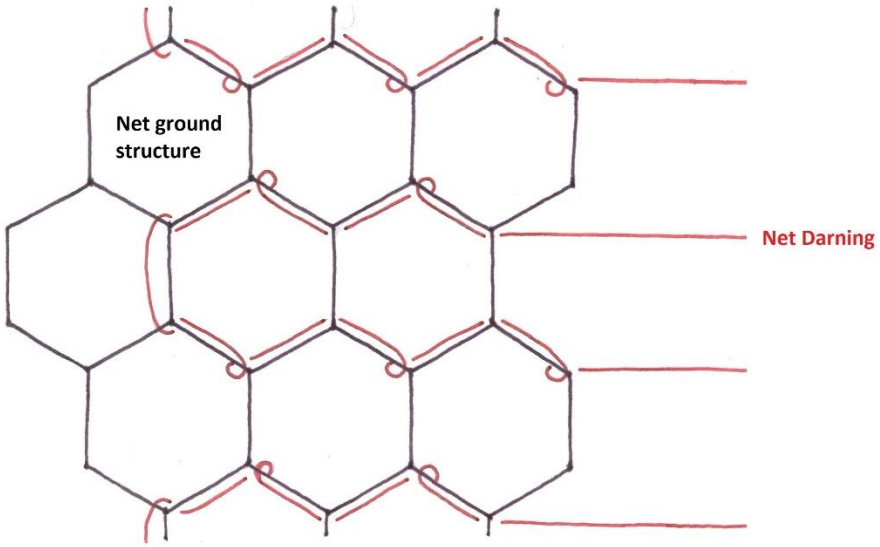


Fig. 6.2.2 Diagram illustrating the securing of threads by wrapping.

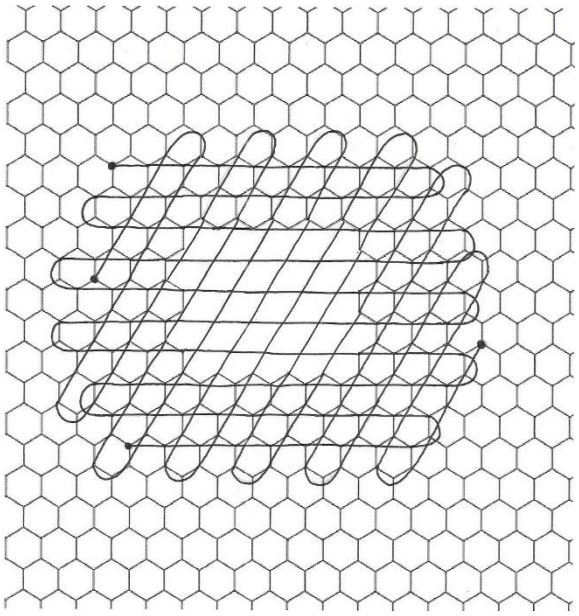


Fig. 6.2.3 Net darning stage 2.

Stage 2 consists of working thread diagonally (from bottom left to top right) through the existing net ground and threads tensioned in stage 1 using the same wrapping technique shown in Fig 6.2.2. It was found that weaving the threads that crossed over the area of loss worked better than the wrapping technique, as the threads can be tensioned without pulling and distorting the threads already in place.

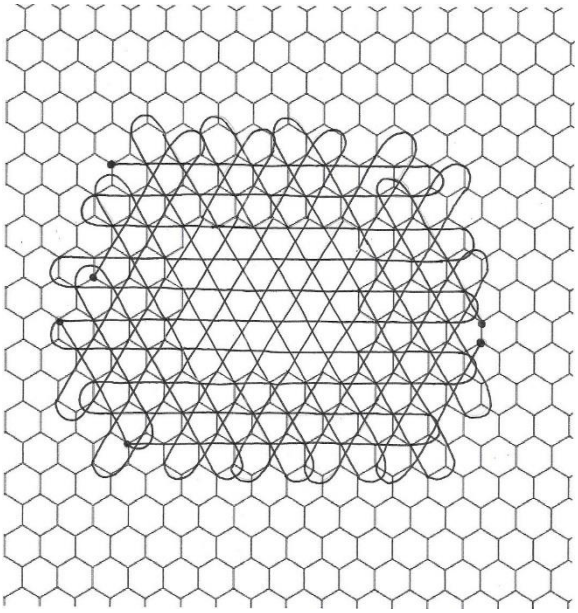


Fig. 6.2.4 Net darning stage 3.

Stage 3 consists of working thread diagonally in the opposite direction to stage 2 (from bottom right to top left).

6.3 Bobbin Lace Making

A bobbin lace patch was made to support and infill an area of damage to the net ground on KFRC Lace Piece A. This was done following instructions from a range of sources.[45,46,47,48,49] Extra fine Egyptian cotton thread (175/2) was also used to carry out the technique.

A. Making a Pricking

The net ground was photocopied to produce a near accurate scale to trace and mark out an initial pricking (Fig. 6.3.1). The average distance was measured between these marks and translated onto graph paper to the size of the patch required (Fig. 6.3.2).

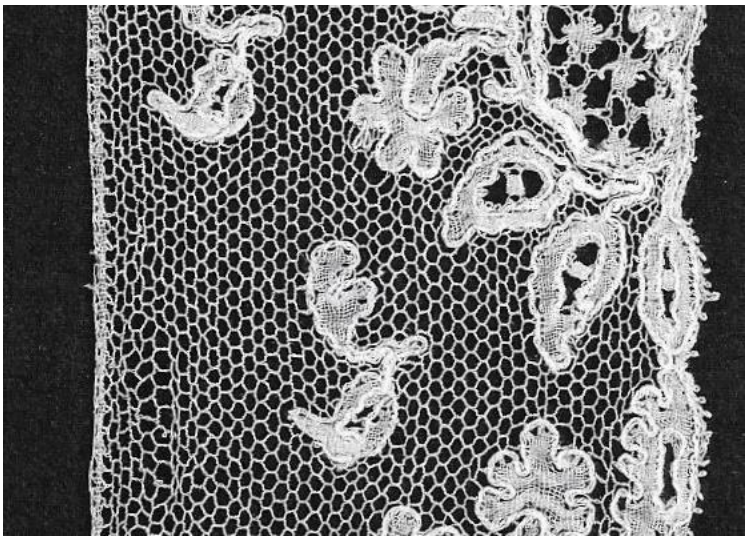


Fig. 6.3.1 Photocopy of KFRC Lace Piece A.

[45] Doreen Wright, *Bobbin Lace Making* (London: Bell & Hymann, 1983).
[46] Ann Margaret Keller, *The Enchanted Lace: A Selection of Twelve Pattern Sets with Instructions* (Dublin: Ann Margaret Keller, 1992).
[47] Gillian Dye and Adrienne Thunder, *Beginner's Guide to Bobbin Lace* (Kent: Search Press Ltd., 2008).
[48] Kurella, *Anybody Can Mend Lace and Linens*.
[49] Jules Knot, *Bobbin Lace-Form by the Twisting of Cords* (London: George Allen and Unwin Ltd., 1973).

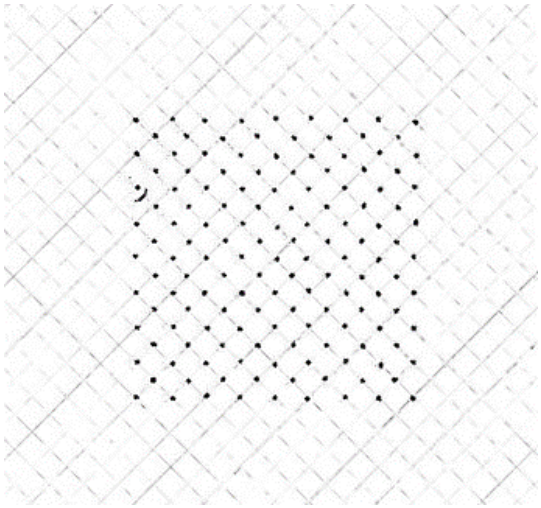


Fig. 6.3.2 Pricking for net ground matching KFRC Lace Piece A.

Blue transparent adhesive film, used in lace making, was adhered to the surface of the pricking. The film provides strength, prevents the pricking from becoming damaged when in use, and makes it re-useable. The pricking was pinned centred towards the top of the pillow. Stainless steel pins were used throughout. The pricking was pierced vertically in advance of making the lace to make it easier to locate the position of the pins when the patch is in progress (Fig. 6.3.3).

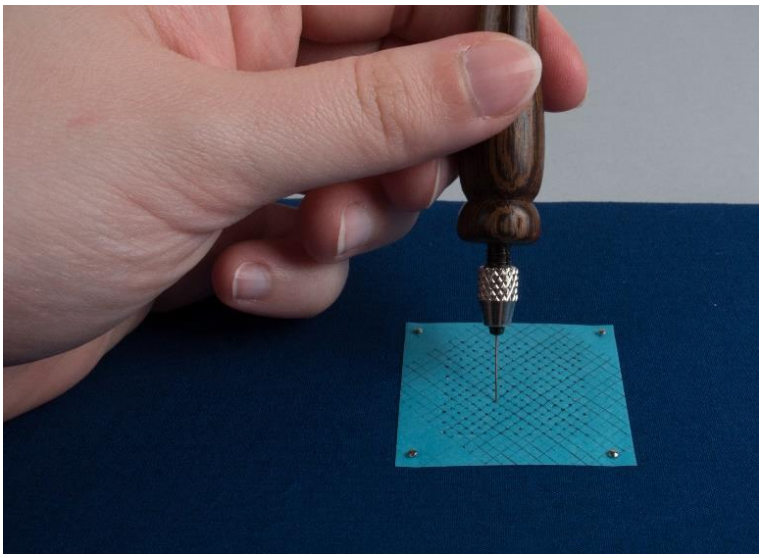


Fig. 6.3.3 Piercing the prinking.

B. Winding Pairs of Bobbins

The number of bobbin pairs needed was calculated by the number of marks on the top row of the pricking. One pair was needed for each edge mark, two pairs were needed for each mark in between (Fig. 6.3.4). A length of thread was measured, approximately one meter long, and wound onto one bobbin without cutting the thread off the spool following Figure Sequence 6.3.5. Securing the thread onto the bobbin is known as 'making a hitch.' This ensures the thread hangs firmly off the bobbin without unravelling. More thread can be released by twisting the bobbin. The second length of thread was measured and cut off the spool. This was wound in the same way, making each pair of bobbins share one length of thread. (The length of thread can be increased or decreased depending on the size of the patch being made).

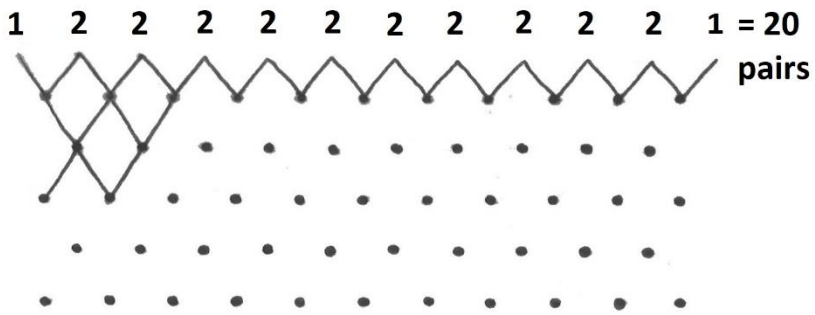
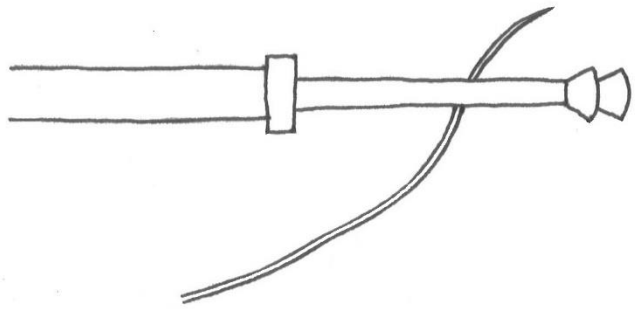
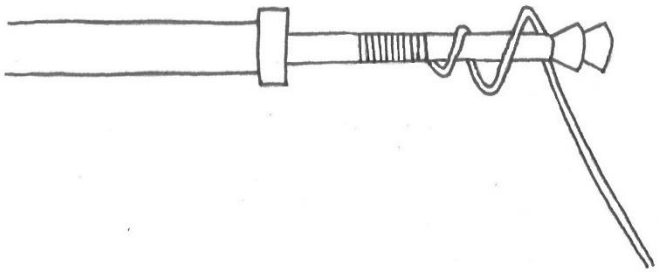


Fig. 6.3.4 Calculating pairs of bobbins.

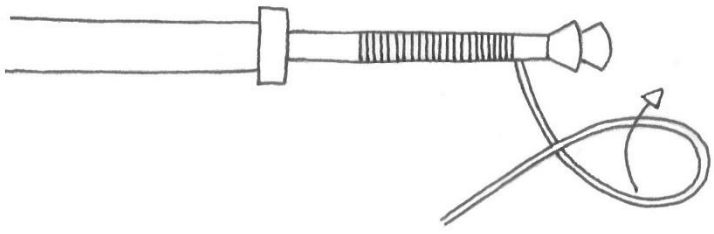
Figure Sequence 6.3.5 Winding pairs of bobbins.



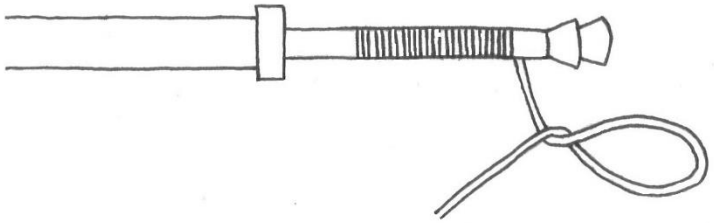
Hold thread to the back of the bobbin.



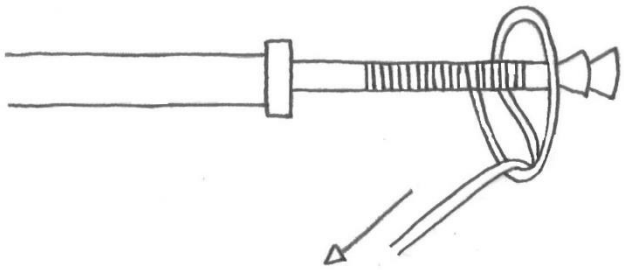
Tightly wrap the thread clockwise around the bobbin



Make a loop.



Twist the loop clockwise once, making a hitch.



Hook the hitch onto the bobbin and pull the remaining thread to secure the hitch, and prevent the thread from unravelling.

C. Half Stitch Twist

After examining the lace structure under a stereo microscope, half stitch twist was chosen as the manoeuvre that matched net ground of KFRC Lace Piece A. See Figure Sequence 6.3.6.

Figure Sequence 6.3.6. Half Stitch Twist.

Arrangement of bobbin pairs before any manoeuvre.

No. 2 over No. 3.

No. 3 over No. 1 and No. 4 over No. 2 (Half stitch).

No. 1 over No. 3 and No. 2 over No. 4 (First twist).

No. 3 over No. 1 and No. 4 over No. 2 (Second twist).

Place pin in the pricking between No. 1 and No. 4, and apply tension.

D. Hanging the Bobbins

Temporary pins were placed beyond the main pricking to hang the bobbins (Fig. 6.3.7). Half stitch twist was worked across all bobbins, placing a pin into the corresponding mark on the top row of the pricking – except for the two outside pairs. These were worked in on the second row (Fig. 6.3.8). Three rows of the pattern were worked before the temporary pins were removed, and the threads were tensioned downwards against the pins on the first row.

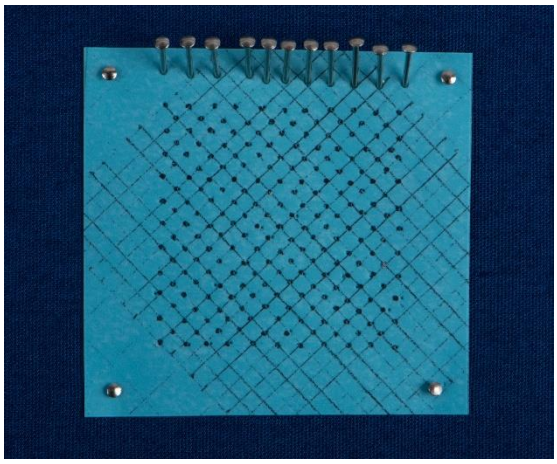


Fig. 6.3.7 Placing of temporary pins.

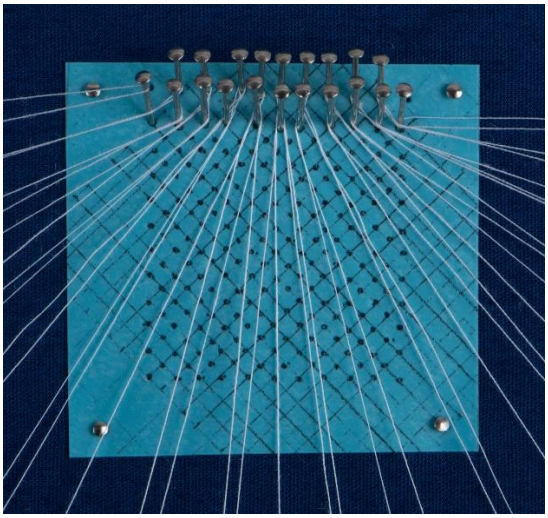


Fig. 6.3.8 Hanging the bobbins.

E. Working the Pricking

After the temporary pins are removed, it is worth noting that some find it easier to continue to work the pricking horizontally (Fig. 6.3.9), while others find it easier to work the pricking diagonally (Fig. 6.3.10).

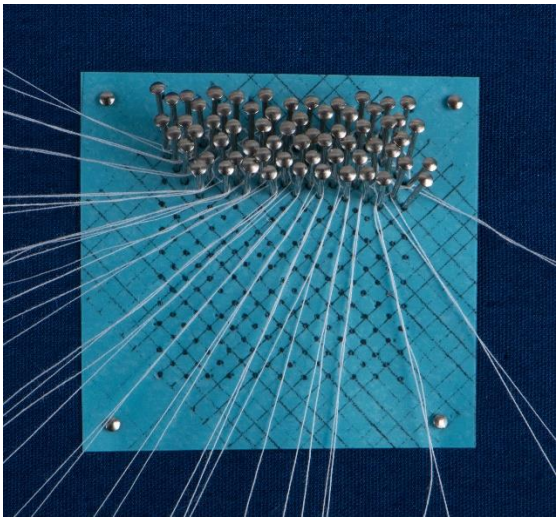


Fig. 6.3.9 Working the pricking horizontally.

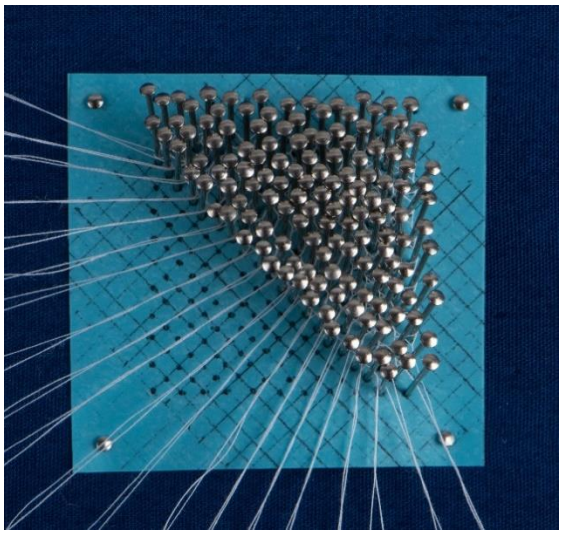


Fig. 6.3.10 Working the pricking diagonally.

F. Tying Off

Once the end of the pricking was reached (Fig. 6.3.11), a final row of half stitch twist was competed and tensioned to create a secure edge (Fig. 6.3.12). Each pair was tied in a double knot following Figure Sequence 6.3.13.

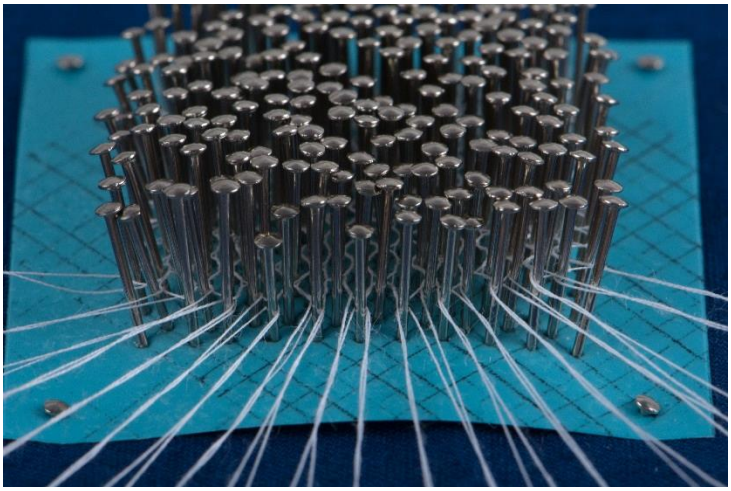


Fig. 6.3.11 Before covering the last row of pins.

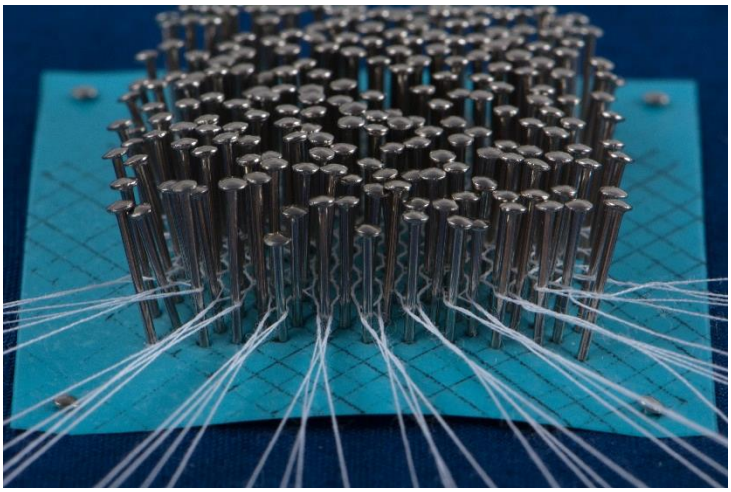
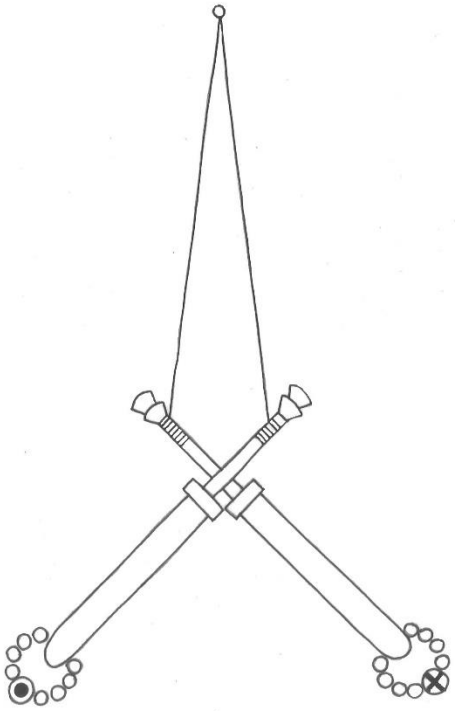
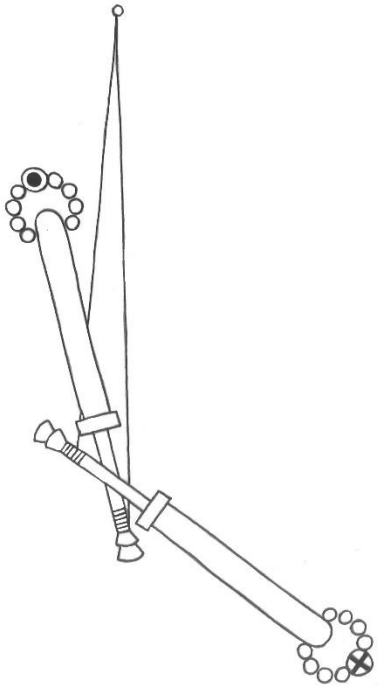


Fig. 6.3.12 After covering the last row of pins.

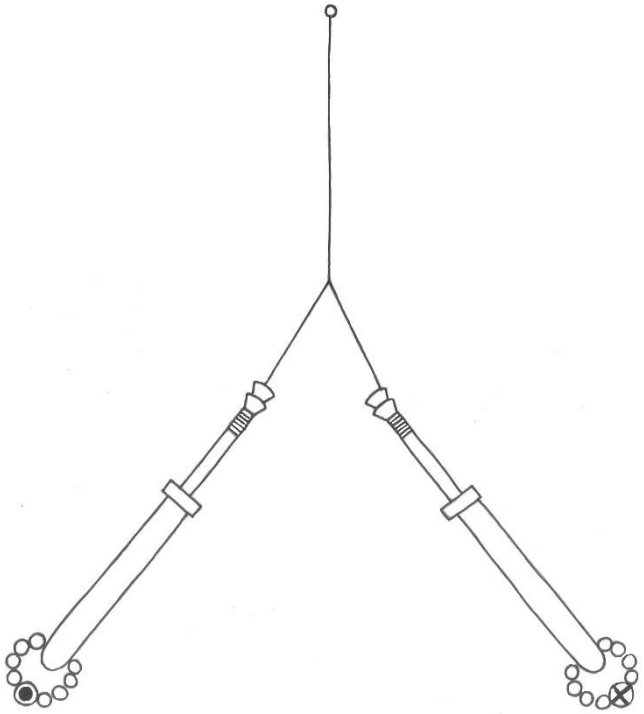
Figure Sequence 6.3.13 Tying off the bobbins.



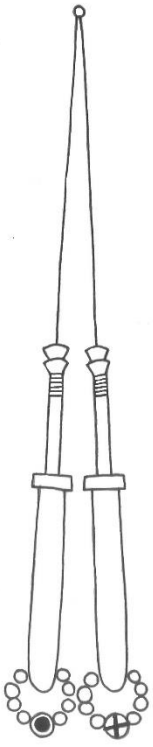
Left bobbin over right.



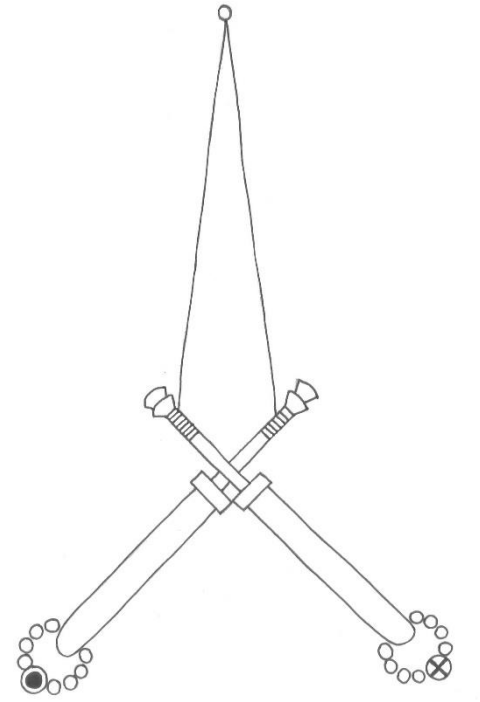
Turn left bobbin behind the right and bring it forward through the loop created by the thread.



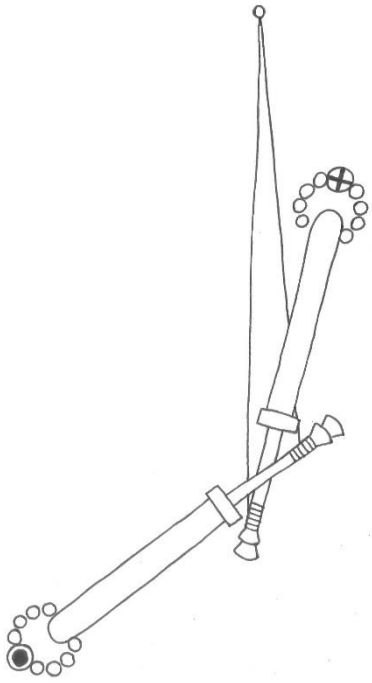
Gently pull bobbins apart.



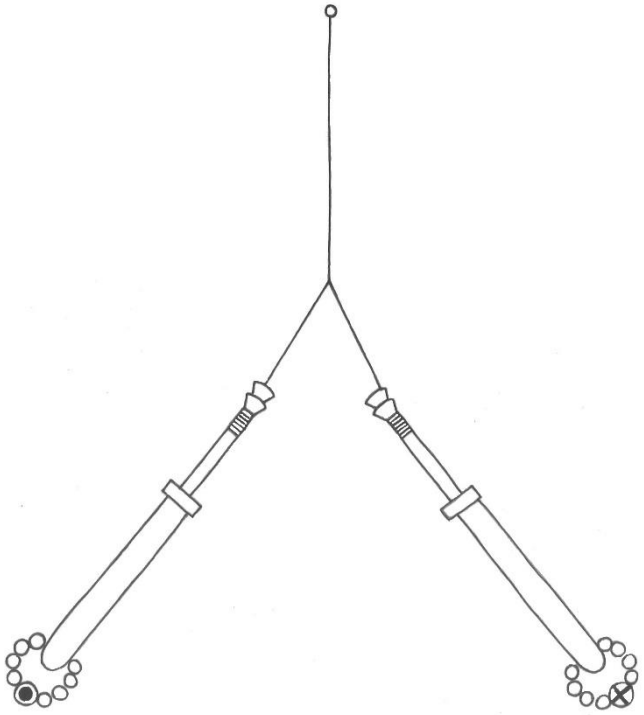
Tighten the knot until it reaches the pin. First knot is complete.



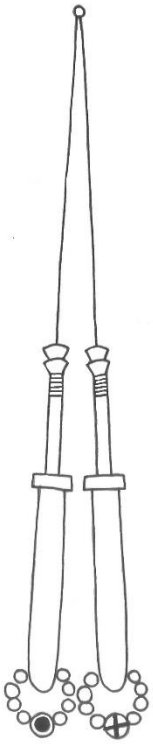
Right bobbin over left.



Turn right bobbin behind the left and bring it forward through the loop created by the thread.



As before.



As before. Double knot complete.

G. Cutting off the Bobbins

Once all pairs were securely tied (Fig. 6.3.14), the thread was cut freeing the bobbins from the patch (Fig. 6.3.15). It is important to leave some length in the threads that are cut to help when removing the pins.

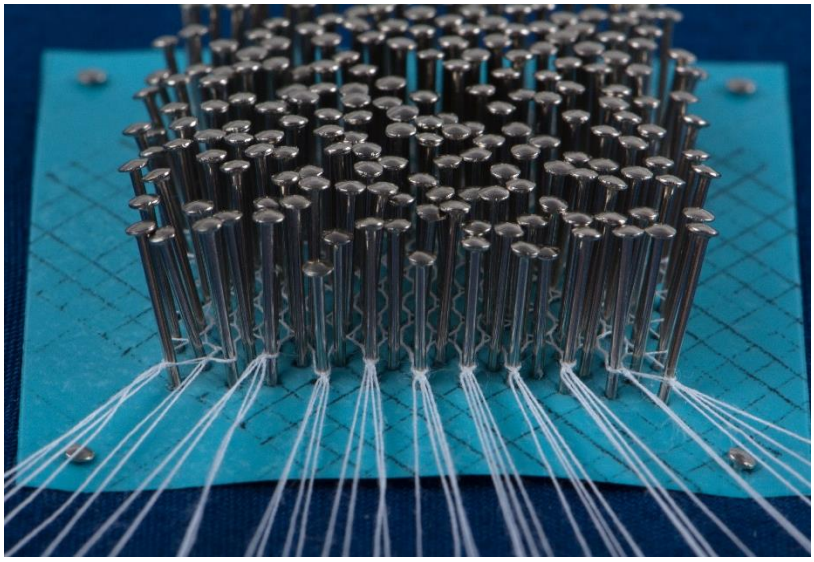


Fig. 6.3 14 After tying bobbins.

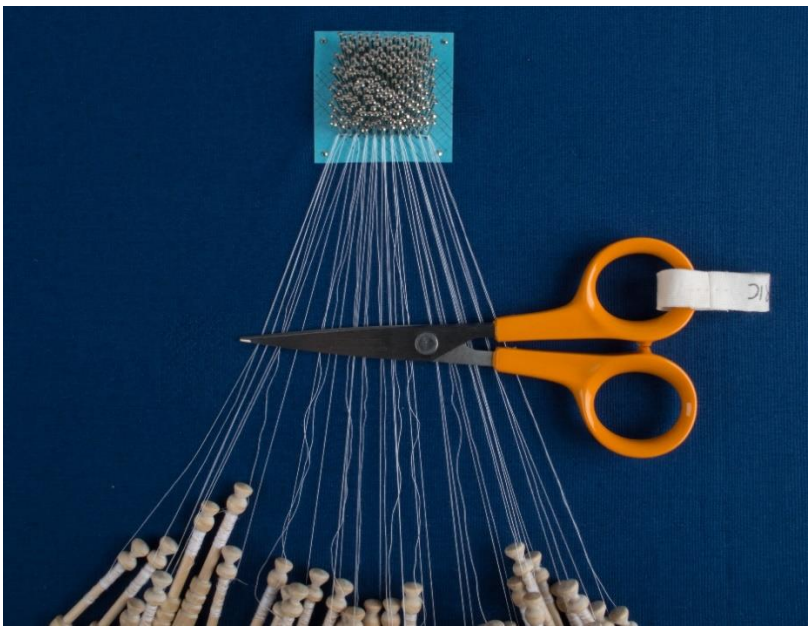


Fig. 6.3.15 Cutting off the bobbins.

H. Removing the Pins

The length of excess thread was held down while the pins were removed. This helped to prevent the pins from pulling the lace up and distorting the structure (Fig. 6.3.16). Once all pins were removed, the excess thread was trimmed away.

Fig. 6.3.16 Removing the pins.

I. Finished Patch

Fig. 6.3.17 illustrates a detail of the net ground from KFRC Lace Piece A. Fig. 6.3.18 illustrates a detail of the closely matching half stitch twist patch.

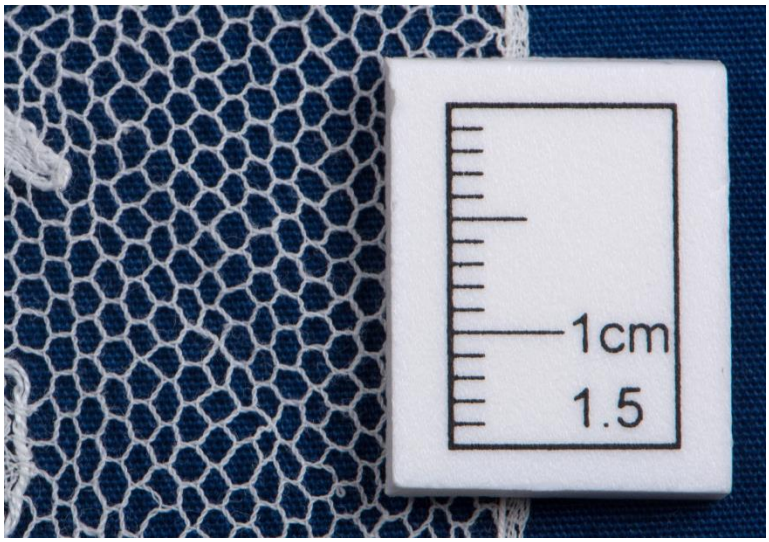


Fig. 6.3.17 Net ground of KFRC Lace Piece A.

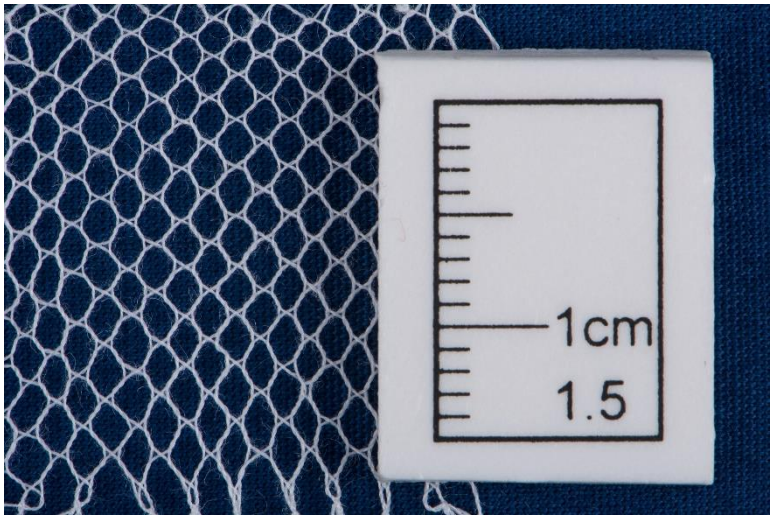


Fig. 6.3.18 Net ground of bobbin lace patch.

6.4 Aesthetic Evaluation

The techniques outlined in sections 6.2 and 6.3 were applied to KFRC Lace Piece A, as well as other materials noted in chapters 3 and 4. Due to time constraints, each patch was sewn around the edges, leaving the perimeter around the areas of damage unsupported except for the area of damage supported by net darning. With more time, further stitching would have been implemented to secure the vulnerable edges around the damage to the support patch. Therefore, the evaluation of methods looked at their aesthetic qualities only. Before and after images illustrate the aesthetics of each technique in Figures 6.4.1-6.4.16. These have been evaluated in a table for ease of making comparisons between methods under specific criteria (Table 64).

Fig. 6.4.1 Area of damage A before supporting.

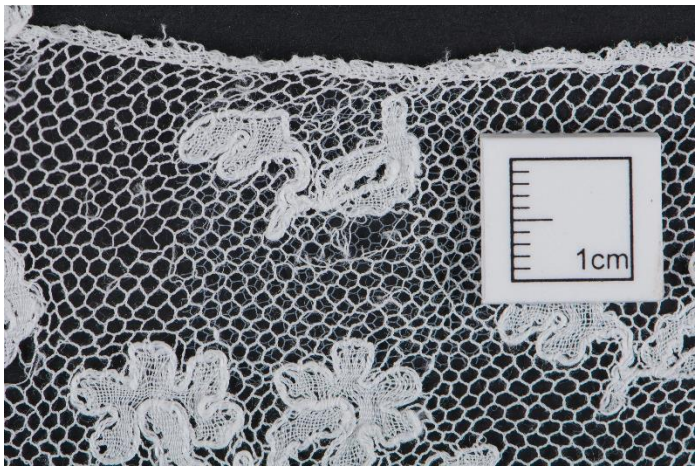


Fig. 6.4.2 Area of damage A after supporting with a 20-denier nylon net patch.

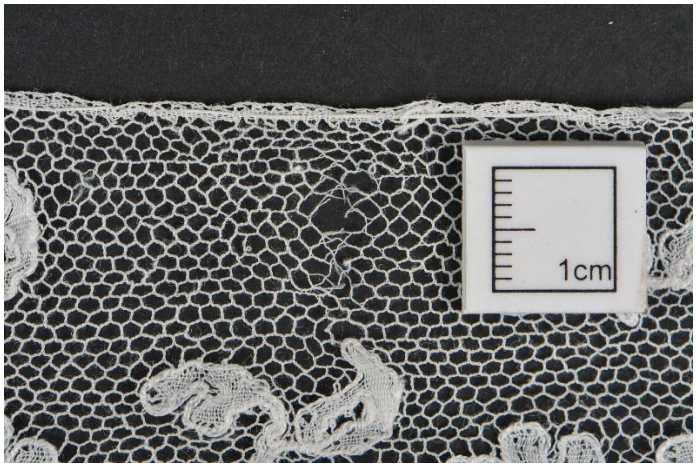


Fig. 6.4.3 Area of damage B before supporting.

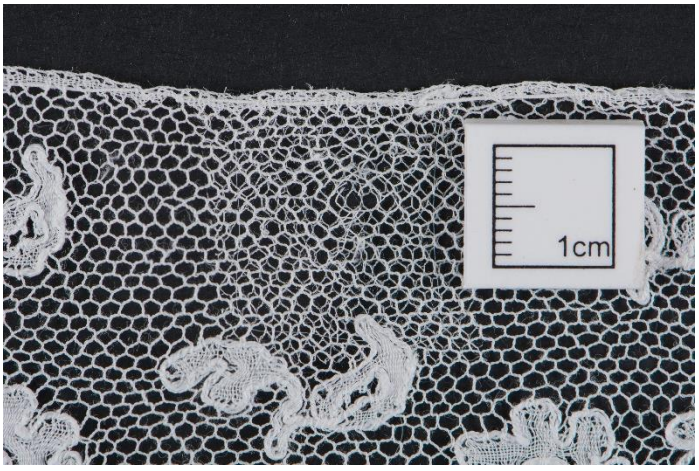


Fig. 6.4.4 Area of damage B after supporting with a silk net patch.

Fig. 6.4.5 Area of damage C before supporting.

Fig. 6.4.6 Area of damage C after supporting with a cotton net patch.

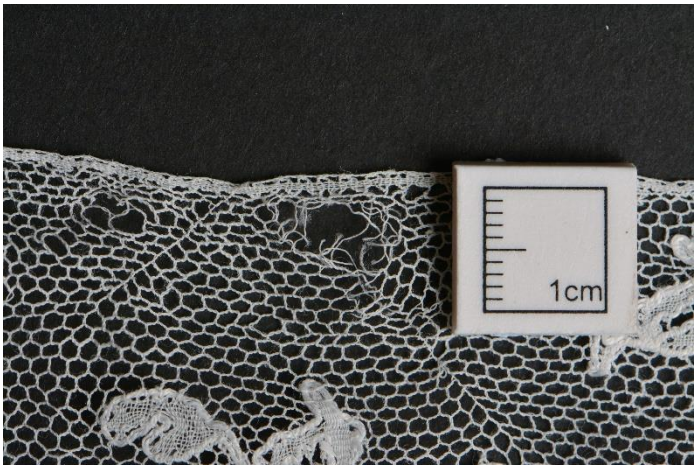


Fig. 6.4.7 Area of damage D before supporting.

Fig. 6.4.8 Area of damage D after supporting with silk crepeline.

Fig. 6.4.9 Area of damage E before supporting.

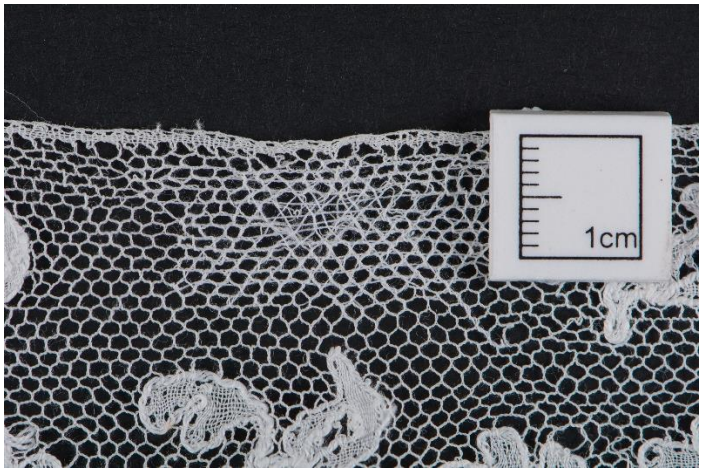


Fig. 6.4.10 Area of damage E after supporting using the net darning technique.

Fig. 6.4.11 Area of damage E (reverse) after supporting.

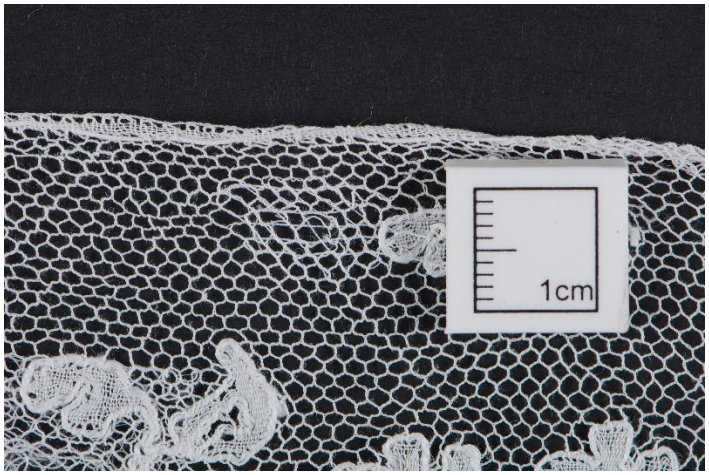


Fig. 6.4.12 Area of damage F after supporting using the net darning technique.

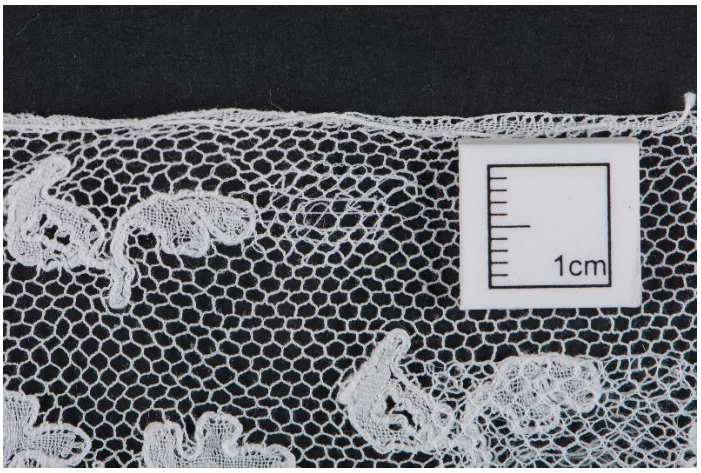


Fig. 6.4.13 Area of damage F (reverse) after supporting.

Fig. 6.4.14 Area of damage G before supporting.

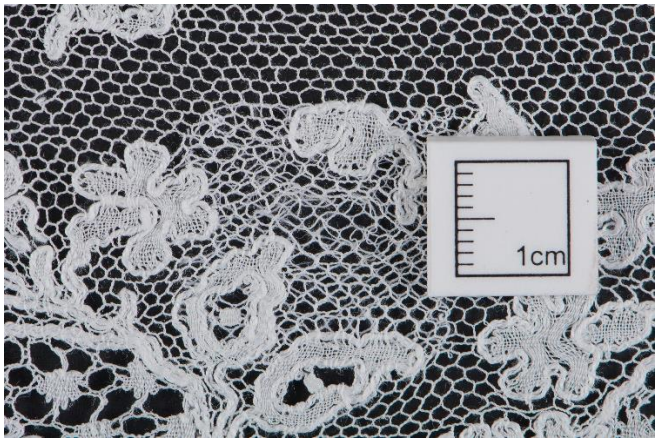


Fig. 6.4.15 Area of damage G after supporting with bobbin lace patch.

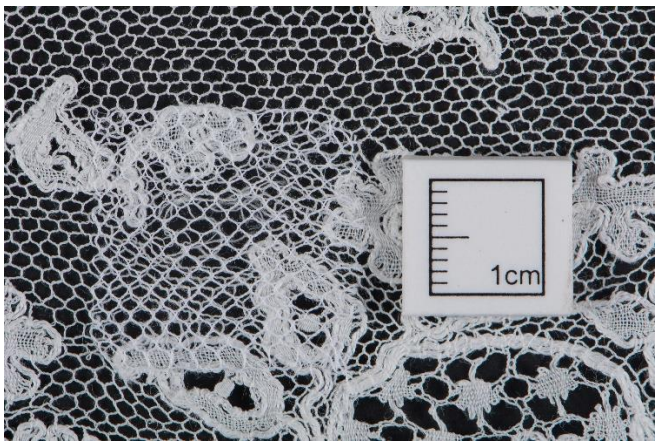


Fig. 6.4.16 Area of damage G (reverse) after supporting.

Table 6.4 Aesthetic evaluation of the supplementary methods for KFLC Lace Piece A.

Area of Damage	Figures	Material	Patch/ Integrated/ Other	Stitching	Weight	Scale/pattern	Overall Aesthetics	Time (min)	Reversibility	Additional comments.
A	6.4.1-6.4.2	20 denier nylon net.	Patch.	Couched using Stabiltex®.[50]	Very light.	Smaller than net ground on object.	Non-intrusive. Shadowing caused by layering two net structures.	30.	Easily reversed.	Did not provide an accurate visual infill. Material does not fray when cut.
B	6.4.3-6.4.4	Silk net.	Patch.	Couched using Stabiltex®.	Light.	Like net ground on object.	Non-intrusive. Shadowing caused by layering two net structures.	30.	Easily reversed.	Provided better visual infill than nylon net. Material does not fray when cut.
C	6.4.4-6.4.6	Cotton net.	Patch.	Couched using Stabiltex®.	Heavy.	Smaller than net ground on object, contributed to density of the patch.	Intrusive, and distracting.	30.	Easily reversed.	Did not provide an accurate visual infill. Material does not fray when cut.

[50] Couching was done using threads pulled from polyester Stabiltex® without laying a thread across the lace.

D	6.4.7-6.4.8	Silk crepeline.	Patch.	Couched using Stabiltex®.	Light.	Woven fabric fully enclosed the open-work nature of lace.	Intrusive. Appeared obvious, and out of place due to gauze-like appearance.	60.	Easily reversed.	Provided least accurate visual infill. Material will fray.[51]
E	6.4.9-6.4.11	Cotton thread.	Integrated.	Net darning.	Heavy – due to all three stages used.	Matching scale.	Intrusive. Extra bulk caused by use of all three net darning stages and or choice of thread.	90.	Not easily reversed.	Integrated nature avoids shadowing. Difficult to work in frayed threads around area of damage.
F	6.4.12-6.4.13	Cotton thread.	Integrated.	Net Darning.	Light – due to stages 1 and 2 used only.	Closely matching scale.	Non-intrusive. Absence of stage 3 of net darning provided an accurate infill without adding bulk.	60.	More easily reversed than Damage E., because of less stages used.	Integrated nature avoids shadowing. Difficult to contain/work in frayed threads around area of damage.

[51] A light layer of 5% Klucel G™ (cellulose based adhesive) was applied around the edges of a silk crepeline patch to prevent it from fraying and meant that turned edges were avoided as this made the patches even more noticeable.

G	6.4.14-6.4.16	Cotton Thread.	Patch.	Net ground bobbin lace patch couched using Stabiltex®.	Heavy.	Closely matching scale, replicating net ground on object.	Intrusive. Visually distracting – weight and scale matched but did not align due to irregularities in objects net ground. Shadowing caused by layering two net structures.	120.	Easily reversed.	Provided accurate infill for area of loss. Bobbin lace patch does not fray, but cannot be altered after it has been made.

6.5 Conclusion

In answering the second research question, it can be concluded that both bobbin lace making and other hand skills, such as net darning, can be used as supplementary methods for the conservation of net ground structures. While materials in common practice such as nylon net are relatively fast treatments, the use of bobbin lace patches and net darning provide a more accurate representation of the lace in question.

It was found that stage 3 of net darning can be omitted if stages 1 and 2 are able to provide sufficient support without causing too much bulk in the surrounding area. This further emphasises the importance of choosing the right weight of thread. This method appears to be best suited for supporting smaller areas of net ground. Applying one or two of the stages could also be considered to stabilise a weak area at risk of structural damage.

An advantage to this integrated technique is that it doesn't define an obverse or reverse to the lace. A disadvantage is that the frayed threads that remain around the area of damage are more noticeable when they are not worked into the darning. In addition, while it takes time to apply, it can take just as long to reverse as it becomes difficult to differentiate between the original and repair threads.

In the case of bobbin lace making, trying to match the small scale of the lace and aligning the patch was difficult because of the non-uniform nature of the object's net ground (Fig. 6.3.17). Therefore, it is suggested that this method is best suited to infill a large area of loss, accurately representing the original structure of the lace that is missing, while being minimally disruptive around the perimeter of the damage. It is also worth considering merging both methods - using threads pulled from polyester Stabiltex® to net darn the bobbin lace patch around the perimeter of loss to help better align the net structures together, and reduce shadowing. This is highly effective way of accurately representing the original structure of the missing lace, as outlined in Fig. 6.4.18.

The main disadvantage of this technique is the time required to prepare the bobbins and design the pricking before the making of the infill can commence. However once made it is relatively quick, easy to apply and remove, and the pricking can be saved and

re-used in the future. As with any skill, one becomes better, and faster with practice. Making net ground is the first technique one learns when learning lace making, just as casting on stitches is the first step for knitting. Basic lace making can be picked up with relative ease and requires no previous knowledge or experience.

The success of any method used is subject to the nature and condition of the lace being conserved, the quality of the conservator's skills and the time available to carry out the treatment. Given all the factors, under consideration, it can be concluded that, if time allows, supplementary methods such as net darning and bobbin lace patching should be explored.

Chapter 7 Investigation into the Safe Use of Water-Soluble Materials for KFRC Lace Piece B

7.1 Introduction

This, and the following chapter aim to investigate the use of four water-soluble sewing substrates for the conservation of guipure ground structures. Over-sewing, and building up layers of stitching, allows the threads to interlock and hold the overall shape together after the substrate is dissolved, mimicking the guipure ground structure of the historic lace. Due to the vulnerability of historic lace and the unknown behaviour of these materials, various tests were carried out to determine the chemical composition and stability of the materials and to determine whether they are safe to use in contact with historic lace should residue remain after the substrate is solubilised.

Two different types of commercially available water-soluble materials were sourced, 100% poly (vinyl alcohol) (PVA) (PVOH) water-soluble film; and 90% Cellulose/10% PVA water-soluble paper. Two of each type were sourced from separate suppliers, making up four materials in total.

Table 7.1 Water-soluble materials.

No.	Soluble Material	Advertised Composition	Supplier
1.	Sulky® Solvy (film)	100% PVA	Sulky®
2.	Gütermann Sulky® Solvy (film)	100% PVA	Gunold®
3.	Aquatics Paper	90% Cellulose/10% PVA	Barnyarns Ltd.
4.	Gütermann Sulky® Paper Solvy	90% Cellulose/10% PVA	Gunold®

MSDS were made available for materials 1 and 2. The suppliers for Sulky® listed their PVA as Poly (vinyl alcohol) (PVOH); 70% PVOH, 30% glycerine, starch, and additives. Gunold® listed their PVA as 100% polyester. MSDS were not made available for

materials 3 and 4.[52] See appendix IV for a brief explanation of the chemical composition of PVA.

Section 7.2 aims to confirm the advertised chemical composition of each material through FTIR. Section 7.3 tests the materials for volatile emissions by Oddy testing, and section 7.4 looks at the solubility and pH-value of the materials when in use. Ideally, no residue should remain after the substrates are solubilised, leaving behind the guipure ground infill only, and therefore eliminating the risk of volatile emissions, and extreme pH-values that may come to light in the various investigations.

7.2 Investigation by Fourier Transform Infrared Spectroscopy

FTIR was used to identify the chemical composition of each material, confirm the specifications noted by the suppliers, compare the differences between the same type products made by different suppliers, and to identify the difference between the two types of water-soluble materials. See appendix V for a brief explanation of FTIR.

7.2.1 Methodology

Analysis was done using a Perkin Elmer Spectrum One FT-IR spectrometer featuring a diamond/thallium-bromoiodide CKRD-5 crystal ATR accessory (FTIR-ATR). This was carried out in the Lister Analytical Laboratory at the Centre for Textile Conservation and Technical Art History, University of Glasgow, with the assistance of Dr Julie Wertz and Dr Margaret Smith.

Five spectrums were taken from each material. To take a single spectrum, a sample of the material was compressed between the FTIR-ATR pressure clamp, making direct contact with the crystal. Pressure was applied at a force of 50/100 newtons (N). A force of 50 N (±5) was deemed sufficient for taking all spectra; any less made insufficient

[52] Gütermann ceased trading with Gunold® at the beginning of 2017. Gunold® have now taken over full management of the products, whereby rebranding the Gütermann range for future distribution.

contact with the crystal, any more damaged the sample. Each spectrum was generated from sixteen scans across the wavelength of 4000-400cm^{-1} at a resolution of 8^{cm-1}.

An average spectrum of the five spectra taken for each material was generated using Bio-Rad KnowItAll™ Academic Edition Software. The baseline of the spectrum was levelled to aid the interpretation and comparison of the spectra. The averaged spectra were compared with each other and against standard PVA and cellulose spectra. The PVA standard sample was made from dried non-toxic PVA adhesive made by Colourfull™. The cellulose standard was made available by Dr Margaret Smith.

7.2.2 Results

Comparing materials 1 and 2 to the PVA standard, i.e. 100% PVA, the spectrum in Fig. 7.2.2.1 confirms that both materials are PVA based, identified by peak 1734. Fig. 7.2.2.1 showed no significant difference between materials 1 and 2, having come from different suppliers.

Comparing materials 3 and 4 to the cellulose standard, i.e. 100% cellulose, the spectrum in Fig. 7.2.2.2 confirms that both materials are predominantly cellulose based. The 10% PVA content advertised by the suppliers can be identified by the very minor peak which correlates to the predominant PVA peak at 1734 (Fig. 7.2.2.3). However, the exact percentage cannot be confirmed through FTIR-ATR. Comparing materials 3 and 4, which came from different suppliers, the spectra in Fig. 7.2.2.3 shows that material 3 contains more PVA than material 4, based on its more defined peak at 1735.

Comparing materials 1 and 3, the spectrum in Fig. 7.2.2.4 illustrates the overall difference in chemical compositions. Although both types of materials are advertised as water-soluble for the same craft industry, it remains to be seen how they differ in additional tests.

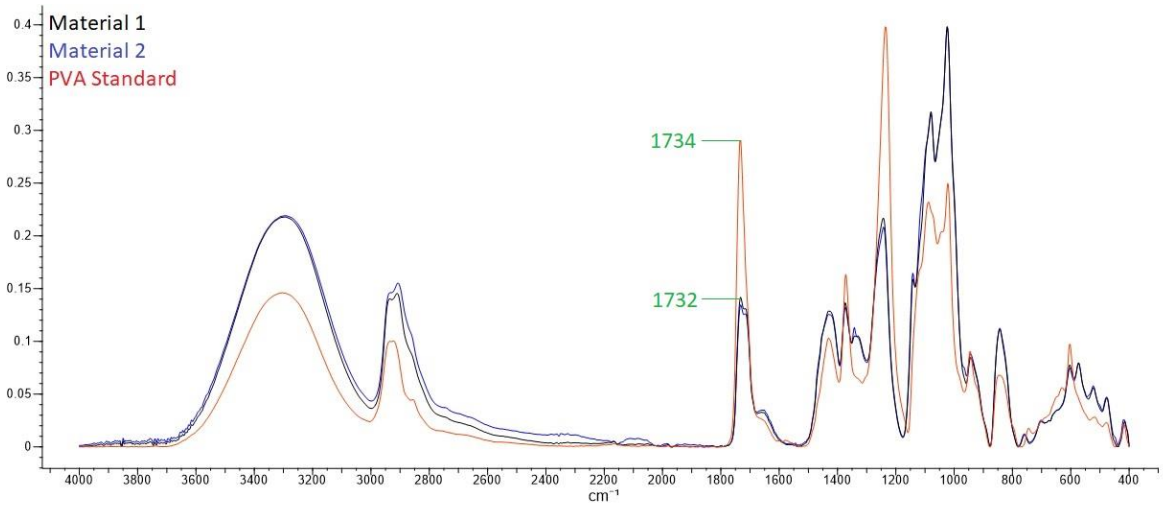


Fig. 7.2.2.1 Spectrum of materials 1 and 2 against PVA standard.

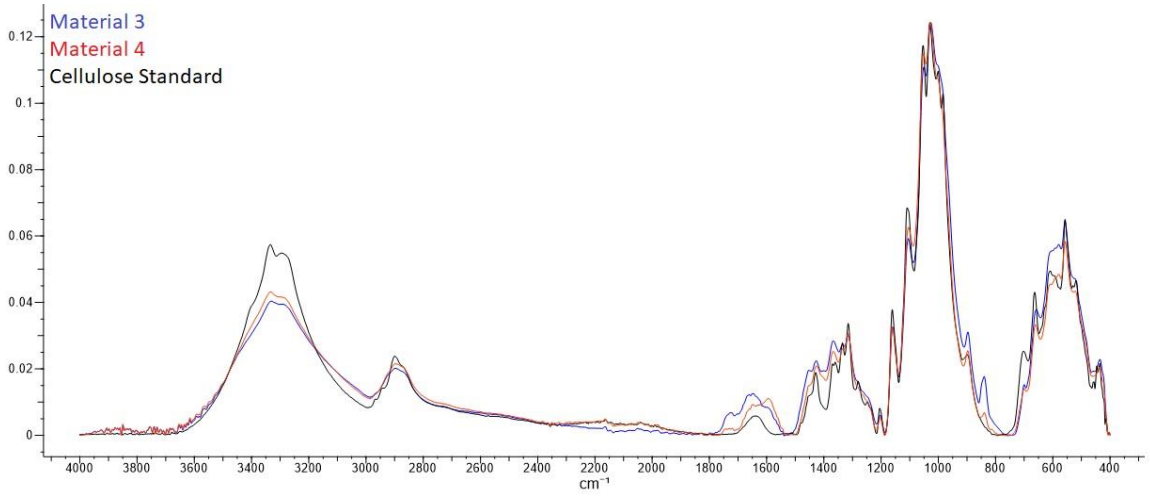


Fig. 7.2.2.2 Spectrum of materials 3 and 4 against cellulose standard.

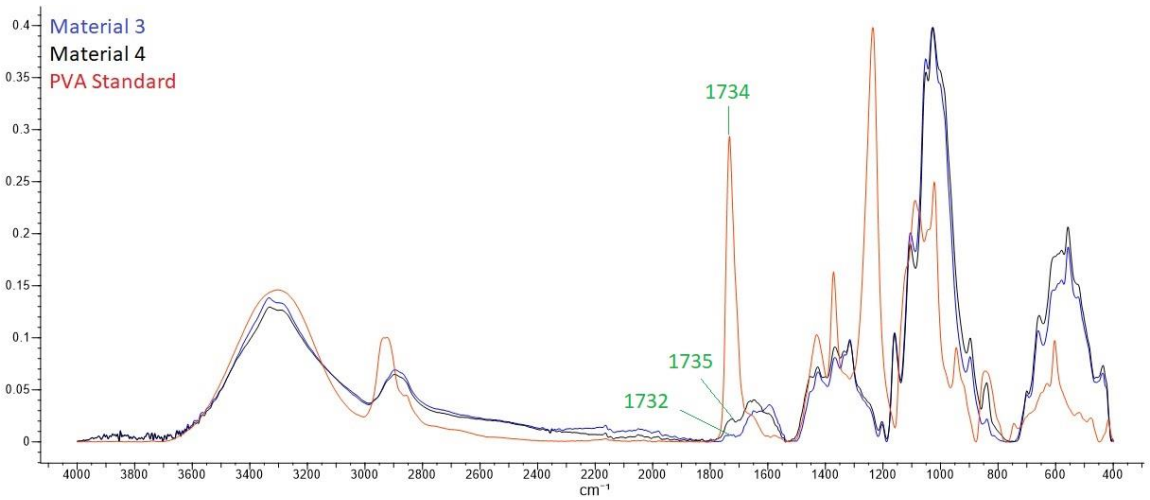


Fig. 7.2.2.3 Spectrum of materials 3 and 4 against PVA standard.

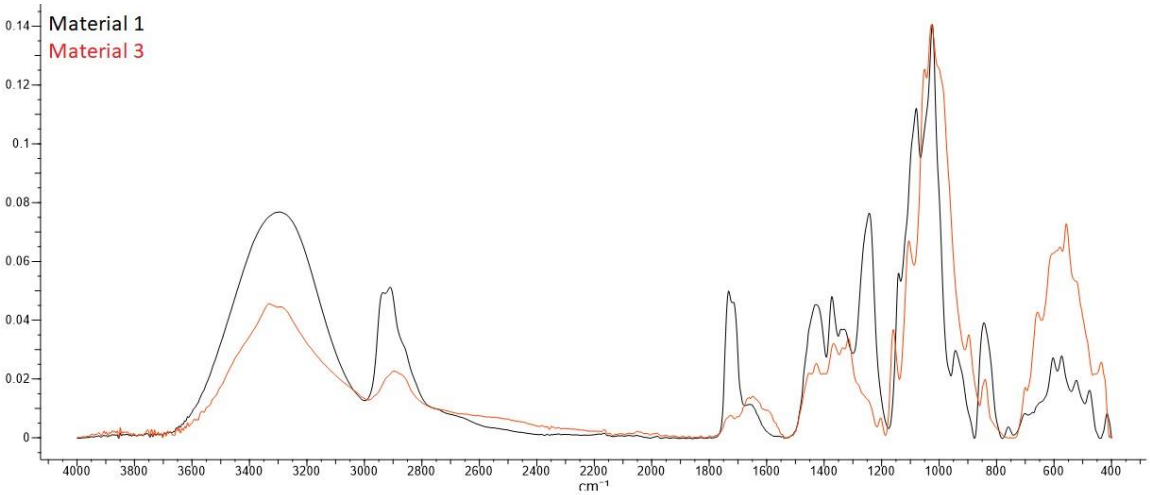


Fig. 7.2.2.4 Spectrum of materials 1 and 3.

7.3 Investigation of Volatile Emissions by Oddy Testing

Oddy testing aims to determine whether the water-soluble materials, listed in Table 7.1 emit volatile emissions, such as solvents or organic acids that may encourage deterioration of historic lace in contact with the materials in the future.[53] See appendix VI for a brief explanation of Oddy testing.

7.3.1 Methodology

Oddy tests were carried out using lab equipment available at the CTC following procedures drawn from various conservation literature sources.[54,55,56,57] See appendix VII for the procedure used. Two replicates of each material were tested. All new metal coupons (silver, lead, copper) and silicone stoppers were used with advice from the British Museum. The silver coupon tests for volatile sulphur compounds, lead tests for volatile acids and copper tests for volatile oxidants.

[53] Andrew Oddy, "An Unsuspected Danger in Display," *Museums Journal 73,* no. 1 (1973): 27-28.
[54] Joseph A. Bamberger, Ellen G. Howe, and George Wheeler, "A Variant Oddy Test Procedure for Evaluating Materials Used in Storage and Display Cases," *Studies in Conservation* 44, no. 2 (1999): 88.
[55] "Oddy Test Protocols," AIC WIKI, http://www.conservation-wiki.com/w/index.php?title=Oddy_Test_Protocols&oldid=4830 (accessed June 18, 2017).
[56] Laurianne Robinet and David Thickett, "A New Methodology for Accelerated Corrosion Testing, "*Studies in Conservation 48, no. 4* (2003): 264-265.
[57] D. Thickett and L.R. Lee, *Selection of Materials for the Storage or Display of Museum Objects* (London: The British Museum Press, 2004), 13.

7.3.2 Results

Unlike FTIR-ATR, the Oddy test produces qualitative results. Visual assessment of corrosion products developed over the course of the test were evaluated following guidelines published by Thickett and Lee.[58] Comparing each metal coupon to its respective control coupon, the test indicated whether the material being tested passed or failed based on the following criteria.[59]

Pass (P) – No (or very minor) tarnishing.

Minor Fail (MF) – Some tarnishing, but not extensive, no corrosion spots.

Fail (F) – Extensive tarnishing and corrosion spots.

Severe Fail (SF) – Extensive corrosion (to the point of disintegration).

All silver coupons showed no change compared to the control, therefore all coupons passed.

The lead coupons for materials 1 and 2 showed surface corrosion in the form of grey/white particulate, and absence of polish, therefore both coupons failed. The lead coupons for materials 3 and 4 were not as severely corroded, showing localised areas of surface corrosion while still retaining a degree of polish, therefore both coupons received minor fails.

All copper coupons showed a gradient of yellow discolouration towards the top of each coupon; all retained a degree of polish, therefore all coupons received minor fails.

[58] Thickett, *Selection of Materials for the Storage or Display of Museum,* 14.
[59] Note that dark areas appearing at the bottom of some metal coupons is not corrosion, but a result of how the light reflected off the coupons when being photographed.

Table 7.3.1 Control for replicates 1 and 2


Silver


Lead

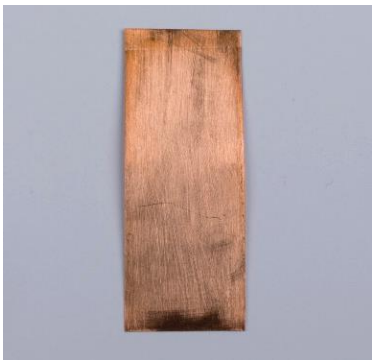

Copper

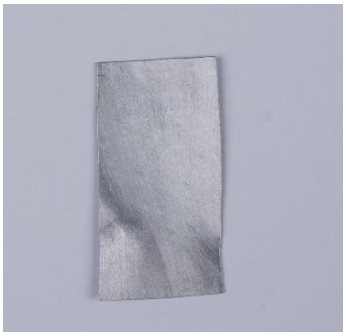
Table 7.3.2 Oddy test results - material 1

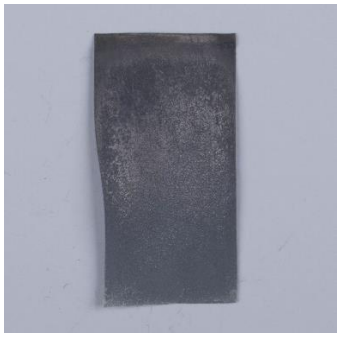
New	Replicate 1	Replicate 2

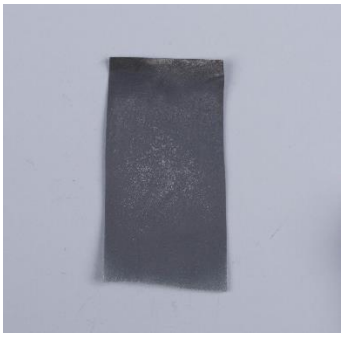

Silver

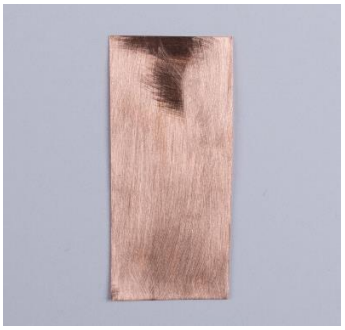

P


P


Lead


F


F


Copper


MF

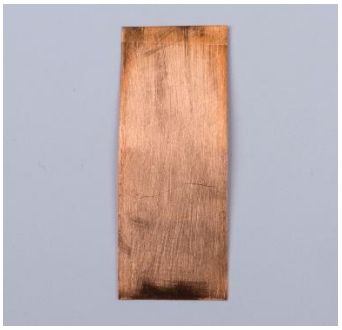

MF

Table 7.3.3 Oddy test results - material 2

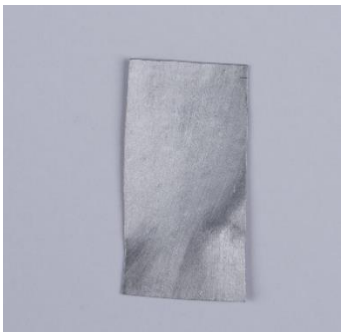
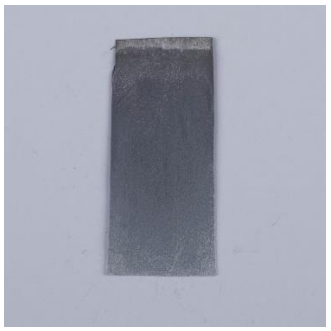
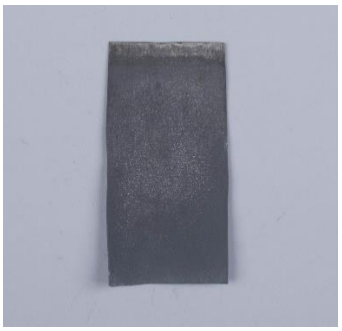
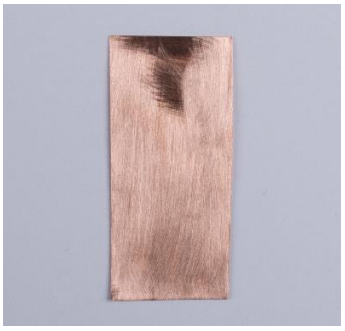
New	Replicate 1	Replicate 2
		
Silver	P	P
		
Lead	F	F
		
Copper	MF	MF

Table 7.3.4 Oddy test results - material 3

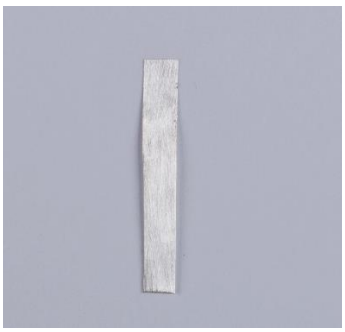
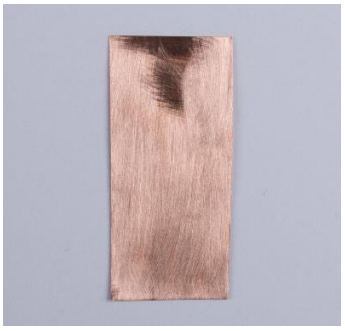
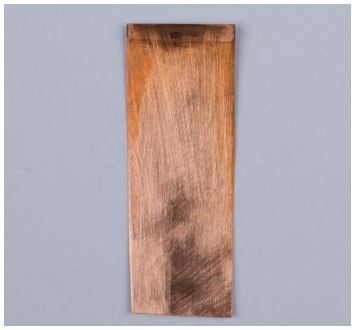
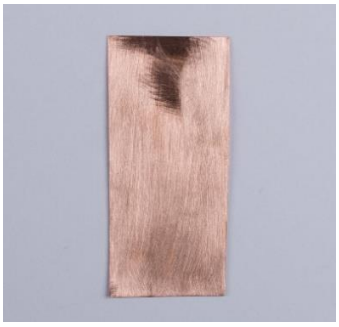
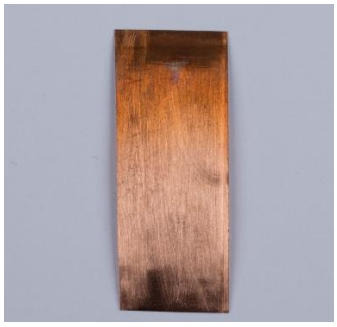
New	Replicate 1	Replicate 2
 Silver	 P	 P
 Lead	 MF	 MF
 Copper	 MF	 MF

Table 7.3.5 Oddy test results - material 4

New	Replicate 1	Replicate 2
 Silver	 P	 P
 Lead	 MF	 MF
 Copper	 MF	 MF

7.4 Investigation of Solubility and pH-Value

An investigation into the solubility and pH value the four water-soluble materials listed in Table 7.1 was undertaken. This was done to evaluate how the materials react when solubilised and to determine the pH-value of residue that may remain in the guipure ground structure when the material is solubilised. See appendix VIII for a brief explanation on measuring pH-value.

7.4.1 Methodology

In accordance with British Standard Institution's document BS EN ISO 3071: 2006, 'Textiles. Determination of pH of aqueous extract',[60] the following methods were used for solubilising each material and measuring their pH-value.

7.4.1.1 Solubility

Eight pieces of each material was prepared weighing 0.5g. Four pieces were solubilised at 20˚C in volumes of 50, 100, 150 and 200ml of deionised water; the remaining four pieces were solubilised at 60˚C in the same volumes. This methodology hoped to answer the following questions:

a. Which type of water-soluble material solubilised the fastest and the slowest?
b. Does the increase of temperature affect the speed at which the materials solubilise?
c. Does the increase in volume (ml) affect the speed at which the materials solubilise?

Each beaker was stirred gently using a glass rod until the solid material became a solute. This method was used due to lack of availability of agitating equipment specified in BS EN ISO 3071:2006. The transition from a solid to a solute was judged through visual examination. Time was recorded using a stop watch. Stirring does not affect the

[60] "Textiles. Determination of pH of Aqueous Extract." British Standards Institution Online, accessed through the University of Glasgow Library. https://bsol-bsigroupcom.ezproxy.lib.gla.ac.uk/Search/Search?searchKey=pH+of+aqueous+extracts+textiles&OriginPage=Header+Search+Box&autoSuggestion=false (accessed June 17, 2017).

solubility of the materials; it only affects the speed at which they become solubilised. Therefore, careful attention was paid to stirring each beaker at the same speed and in the same clockwise circular motion.

All materials became instantly viscous and tacky when introduced to water, and initially stuck to the sides of the glass beaker and rod before completely solubilising. Materials 1 and 2 formed a gel-like viscose material, whereas materials 3 and 4 appeared to break up and disperse into fibres as they solubilised. Materials 1 and 2 produced a transparent cloudy solute, whereas materials 3 and 4 produced an opaque cloudy white solute (Fig. 7.4.1). Approximately five minutes after all four materials were solubilised, materials 1 and 2 appeared to stay suspended in the solution, but materials 3 and 4 separated forming a precipitate at the base of each beaker (Fig. 7.4.2). Also noted was the odour of the films once solubilised. Materials 1 and 2 presented a mild plastic smell, whereas materials 3 and 4 presented a strong fish-like smell.

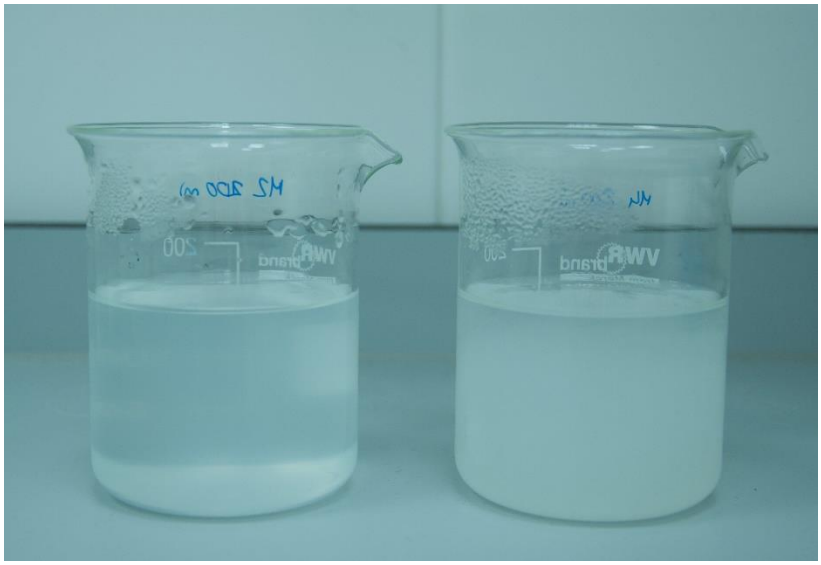


Fig. 7.4.1

Solute of material 2 (Left). Solute of material 3 (Right) not displaying any precipitate.

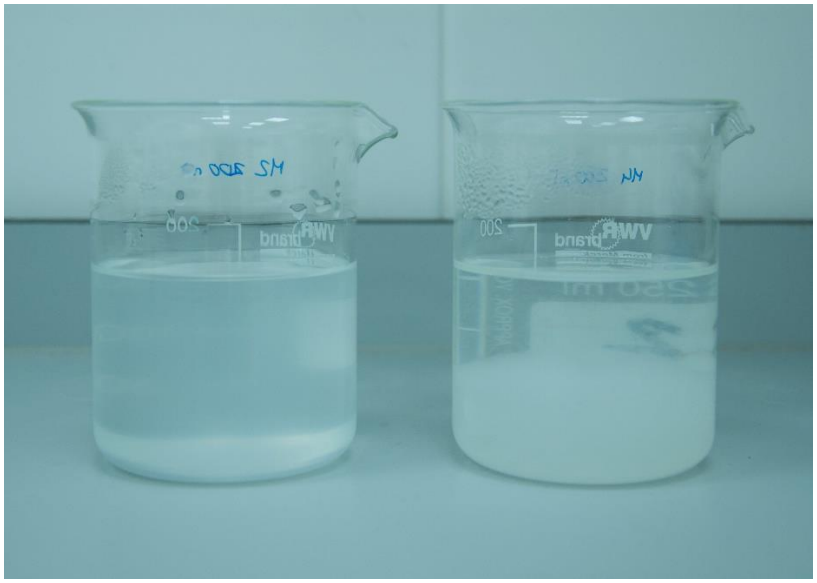


Fig. 7.4.2

Solute of material 2 (left) not displaying any precipitate after 5 minutes.

Solute of material 3 (right) clearly displaying precipitate at the bottom of the beaker after 5 minutes.

7.4.1.2 pH-value

Using the solute prepared in 7.4.1.1, the pH-value of each was recorded using the following devices:

pH reader A: Universal Indicator - Fisherbrand®. Fisher Scientific Number 11316454

pH fix: 2.0-9.0

pH reader B: Calibrated HI9024C Hanna pH Meter

Fig. 7.4.3 pH reader A (Left) pH reader B (Right).

The pH-value for all samples was taken at 20˚C and 40˚C using pH readers A and B. pH reader B was calibrated following instructions outlined in appendix IX. It is important to note that the pH readings, using pH reader B of the materials solubilised at 60˚C was taken at 40˚C following manufacturing specifications not to exceed 50˚C due to the sensitivity of the electrode.

It was critical that the temperature of the intended comparable samples be the same, and the solutions be thoroughly mixed before taking accurate pH readings.[61] Temperature was taken manually for all tests using a thermometer.

This methodology aimed to answer the following questions:

a. What is the pH-value of each water-soluble film, and what are the differences, if any, between the PVA based materials 1 and 2, and the cellulose based materials 3 and 4?
b. Does the increase in temperature affect the pH-value of the solution?
c. Does the increase of the materials concentration in a volume of water affect the pH-value of the solution?

7.4.2 Results

For comparative purposes, the data collated from both solubility and pH-value tests have been combined for each water-soluble material in Tables 7.4.2.1 - 7.4.2.4.

Answering the questions set out in 7.4.1.1, the results show that the cellulose based materials 3 and 4 take less time to solubilise than the PVA based materials 1 and 2. There was no significant difference found comparing the speed at which both PVA based materials solubilised, or the speed of the cellulose based materials. As anticipated, the results show that the rise in temperature from 20 - 60˚C increased the speed at which all four materials solubilised in water. Table 7.4.2.1 shows that material 1 solubilised in 100ml of water at 20˚C at a speed of 38 seconds, compared to 25 seconds at 60˚C. This trend can be seen across all four tables.

[61]Anne Moncrieff, *Science for Conservators Vol.2 Cleaning* (London: Museums and Galleries Commission in conjunction with Routledge, 1992), 100.

Results also show that the increase in volume (ml) aids the speed at which all materials solubilised in water. This is due to the water's increased ability to facilitate, disperse and suspend the solute. Table 7.4.2.2, shows that there is a decrease in the time it takes to solubilise material 2 at 20˚C from 45 seconds in 50mls, to 38 seconds in 200ml. This trend can also be seen across all four tables.

Answering the questions set out in 7.4.1.2, results show that materials 3 and 4 were found to be highly alkaline, measuring pH9.0+ using pH reader A, and between pH9.92-10.09 using pH reader B (Tables 7.4.2.3 + 7.4.2.4). Materials 1 and 2 showed near neutral pH-values measuring pH7.0 using pH reader A and between pH6.80-7.85 using pH reader B (Tables 7.4.2.1 + 7.4.2.2).

It was found that pH-values for materials 1 and 2 recorded using pH reader B were marginally higher at 40˚C than those recorded at 20˚C. pH reader A did not show this difference (Tables 7.4.2.1 + 7.4.2.2). This marginal increase was not recorded for materials 3 and 4 (Tables 7.4.2.3 + 7.4.2.4).

An increase of the materials concentration in a volume of water did not appear to have a significant impact on the pH-value of any of the four water-soluble materials.

Table 7.4.2.1 Solubility and pH-value for material 1.

Material	ml.	g.	˚C	Sec. to solubilise	˚C	pH (A)	pH (B)	˚C	Sec.	˚C	pH (A)	pH (B)
1	50	0.5	20	38	20	7.0	7.02	60	25	40	7.0	7.85
	100			38		7.0	6.96		25		7.0	7.48
	150			37		7.0	6.98		22		7.0	7.50
	200			35		7.0	6.80		22		7.0	7.80

Table 7.4.2.2 Solubility and pH-value for material 2.

Material	ml.	g.	˚C	Sec. to solubilise	˚C	pH (A)	pH (B)	˚C	Sec.	˚C	pH (A)	pH (B)
2	50	0.5	20	45	20	7.0	6.90	60	25	40	7.0	7.77
	100			40		7.0	6.91		25		7.0	7.32
	150			38		7.0	6.92		22		7.0	7.55
	200			38		7.0	6.70		22		7.0	7.38

Table 7.4.2.3 Solubility and pH-value for material 3.

Material	ml.	g.	˚C	Sec. to solubilise	˚C	pH (A)	pH (B)	˚C	Sec.	˚C	pH (A)	pH (B)
3	50	0.5	20	18	20	9.0+	10.06	60	12	40	9.0+	10.09
	100			18		9.0+	10.12		12		9.0+	10.08
	150			15		9.0+	10.10		8		9.0+	9.97
	200			14		9.0+	10.05		7		9.0+	9.95

Table 7.4.2.4 Solubility and pH-value for material 4.

Material	ml.	g.	˚C	Sec. to solubilise	˚C	pH (A)	pH (B)	˚C	Sec.	˚C	pH (A)	pH (B)
4	50	0.5	20	18	20	9.0+	10.06	60	12	40	9.0+	10.00
	100			18		9.0+	10.03		12		9.0+	10.03
	150			14		9.0+	10.02		8		9.0+	9.94
	200			14		9.0+	10.00		7		9.0+	9.92

+ Indicates that the pH value of the solution was greater than the limit of the colour strip at pH9.0.

7.5 Conclusion

Investigation through FTIR outlined in section 7.2 confirmed that the composition of all four materials listed in Table 7.1 were according to the supplier's specifications. No unexpected materials were identified. The spectra illustrated the similarities and differences between the materials and helped to visually measure the PVA content in each.

Weighing up the results from the Oddy test in section 7.3, results show that PVA based materials 1 and 2 were more affected by the accelerated aging test than cellulose based materials 3 and 4. This conclusion is based on the significant corrosion products formed on the lead coupons, causing them to fail the test due to the presence of volatile acids. Looking at the tests overall, the majority passed or received minor fails. While the Oddy test did not produce signs of the effects of aged PVA, such as yellowing and embrittlement, it does not mean it is not likely to happen. Time limitations for this research meant that a longer accelerated aging test could not be carried out. However, should the water-soluble materials fully solubilise after sewing the guipure ground infill, there should be no cause for concern when positioning one in close contact with historic lace.

Following advice outlined by Thickett and Lee at the British Museum, materials with a near neutral pH7, ±1.5 (pH5.5-8.5) are considered safe to use within close proximity of historic objects.[62] Materials outside of this range are not considered safe. Therefore, it can be concluded that cellulose materials 3 and 4 are deemed unsuitable as a water-soluble substrate for the conservation of guipure ground infills due to their extreme alkalinity. Falling within the safe pH range, both PVA based materials are considered suitable for use. Again, this result is only relevant if residue remains. It is worth noting that solubilising the materials within the network of machine stitching can be done at high temperatures considering that the historic object itself does not play a part in this aspect of conservation treatment.

[62] Thickett, *Selection of Materials for the Storage or Display of Museum Objects,* 21.

Following these contrasting results, preliminary tests were carried out to determine which type of material was best suited as a sewing substrate. The initial trial found materials 3 and 4 to be unsuitable. The paper was easily torn when repeatedly sewn through. Paper fibres remained visibly trapped within the network of stitching making it very difficult to fully solubilise. A combination of factors resulted in the elimination of materials 3 and 4 from further testing. Consequently, the following chapter uses 100% PVA water-soluble film and investigated traces of residue through microscopy, aiming to answer the third and final research question, i.e. 'Is water-soluble material viable for use in the conservation of lace?'

Chapter 8 Evaluation of Conservation Methods for KRFC Lace Piece B

8.1 Introduction

Following the results of the preceding chapter, material 1 - Sulky® Solvy, 100% PVA water-soluble film was put into practice as a substrate for a machine sewn guipure ground support and visual infill for the conservation of KFRC Lace Piece B. While materials 1 and 2 preformed the same in the testing phase, the supplier of material 1 provided detailed written and visual instructions for their product. See appendix X.

It was established that material 1 solubilised at a fast rate, and has a near neutral pH ranging between pH6.80-7.85 (Table 7.4.2.2). Due to its near transparent appearance, it remained unknown how well the water-soluble film solubilised when bound within a matrix of stitching, and the possible effects of aged PVA when in close contact with historic lace should any residue remain.

PVA is highly susceptible to photo-oxidation. Colourless PVA fast becomes yellow upon exposure to ultraviolet light. Because of the formation of ketone and aldehyde groups, the solubility of PVA is reduced in water, requiring a less polar solvent to solubilise the discoloured and acidic material. In addition, the number of carboxyl groups increase as photo-oxidation continues, and forms strong secondary bonds which cause the material to become increasingly ridged.[63] Should residue remain imbedded, such factors would have a negative effect on the guipure ground infill, hence the importance of establishing if residue is likely to remain.

Section 8.2 outlines the methodology for the practical application of the material, followed by an investigation of residue using microscopy in section 8.3. Through imagery, section 8.4 evaluates the method when applied to KFRC Lace Piece B, and compares it to methods in common practice, such as support using nylon net.

[63] Ágnes Tímár-Balázsy and Dinah Eastop, *Chemical Principles of Textile Conservation* (Oxford: Butterworth-Heinemann, 1998), 320.

Qualitative results are tabulated. Section 8.5 concludes the experimentation by answering the final research question.

8.2 Methodology

A. Preparing the Material.

Two square pieces of material 1 were cut exceeding the measurements of an embroidery hoop. The embroidery hoop is used to put tension on the substrate and helps to handle and lead the substrate around the machine while it is being stitching through. A piece of 20 denier nylon net was cut to the same size, and two pieces of silicone release paper were cut slightly larger. Silicone release paper ensured that material 1 did not stick to the iron or ironing surface. The nylon net acted as the backbone to the fused substrate, giving it strength when being stitched through. It was found that tensioning the nylon net with pins through to a padded ironing surface as the materials were fused helped to reduce distortion and contraction of the nylon net once the water-soluble substrate is solubilised, and in turn reduced distortion of the finished guipure ground infill. Fig. 8.2.1 illustrates the order of how these materials were layered together, using a dry iron at a medium setting.

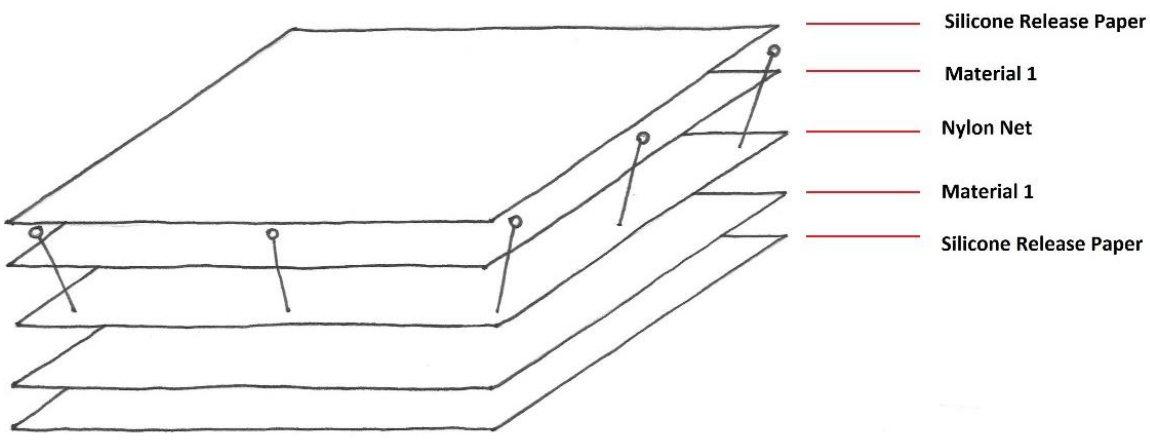


Fig. 8.2.1 Arrangement of materials create the guipure ground soluble substrate.

B. Taking a Pattern.

The fused substrate was placed over KFRC Lace Piece B, and the pattern of the guipure ground around the area of damage was faintly marked with a pencil (Fig. 8.2.2). The fused substrate was tensioned between an embroidery hoop, and the pencil mark was tacked over with thread making it easier to see (Fig. 8.2.3).

Fig. 8.2.2 Tracing the lace pattern onto the soluble substrate.

Fig. 8.2.3

Tensioning the soluble substrate in an embroidery hoop and tacking over the traced pattern.

C. Machine Embroidery.

The machine embroidery was carried out using a Jenome Memory Craft 4900 sewing machine. To use the 'free-hand' setting for embroidery stitching, the feed dog was disabled and the standard presser foot was exchanged for a 'darning' or 'free-hand' foot (Fig. 8.2.4). The machine was threaded in the normal way with the chosen thread - Mettler Stopf. & Stickgam cotton emboridery thread (60/2). The tacking lines were followed, sewing over the lines 5-6 times, building up the lines of stitching to resemble the guipure ground. Stitching through the soluble substrate required careful judgement; too much stitching can create a bulky infill which may weigh down on the already weak lace causing further damage.

Fig. 8.2.4 Machine sewing through the soluble substrate.

D. Dissolving the Substrate.

The sewn substrate was removed from the embroidery hoop, and excess substrate was cut away (Fig. 8.2.5). The remaining substrate was solubilised in two successive beakers of deionised water (60˚C), leaving behind the internal nylon net substrate. The net was pinned out to dry to help retain the shape of the embroidery. Once dry, the nylon net was trimmed away as close to the embroidery as possible, leaving behind the guipure

structural and visual infill for KFRC Lace Piece B (Fig. 8.2.6). The infill was sewn into place with button-hole stitch using thread drawn from polyester Stabiltex®.

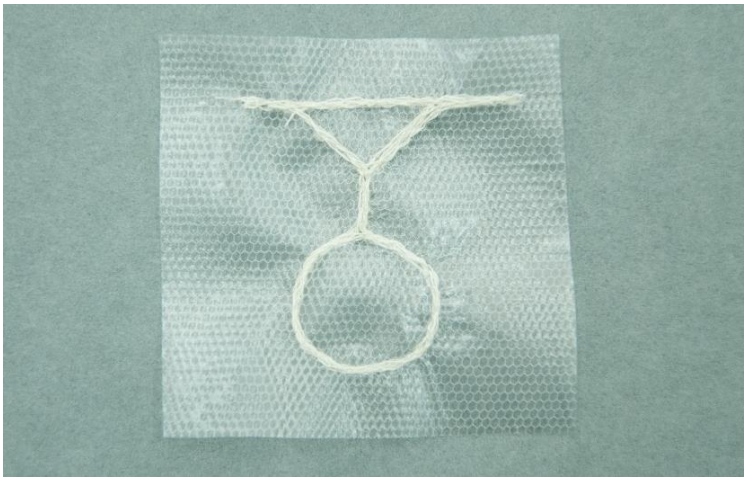


Fig. 8.2.5 Guipure ground before substrate was solubilised.

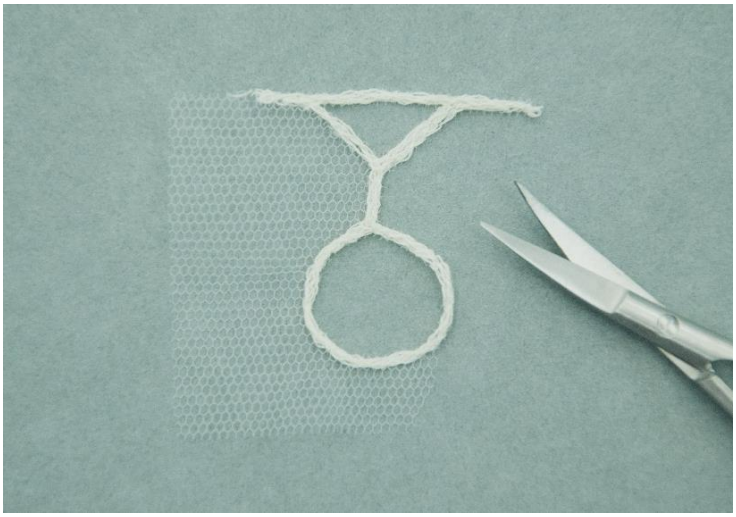


Fig. 8.2.6 Trimming away internal nylon net substrate.

8.3 Investigation of Residue by Microscopy

An exact duplicate of the guipure ground infill was made. Three pieces, before stage D of the methodology outlined in section 8.2 were cut from the duplicate and mounted onto glass slides (Fig. 8.3.1 – Fig. 8.3.3).

Each sample was examined under a Zeiss Stemi 2000-C microscope. Sample 1 shows an un-solubilised substrate (Fig. 8.3.1). The substrate remained dry, and is clearly identified by the blue and orange diagonal stripes crossing over each other against a grainy background. The darker area towards the bottom of the image shows an area of the densely worked cotton embroidery.

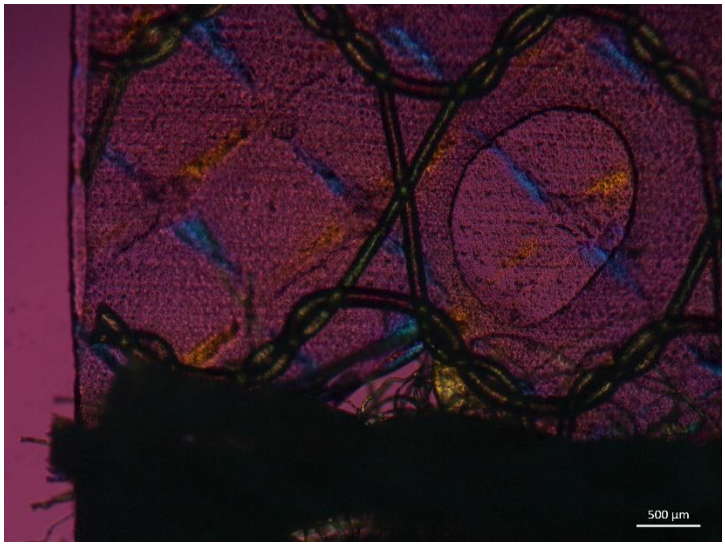


Fig. 8.3.1 Microscopy of residue - Sample 1

Sample 2 shows a partially solubilised substrate (Fig. 8.3.2). Three drops of deionised water were pipetted onto the sample, partially solubilising the substrate. The image no longer shows the blue and orange stripes visible in Fig. 8.3.1, and the harsh outline where the substrate has been cut has also disappeared. Residue appears to remain based on the grainy appearance of the background. The large black rings are believed to be air bubbles.

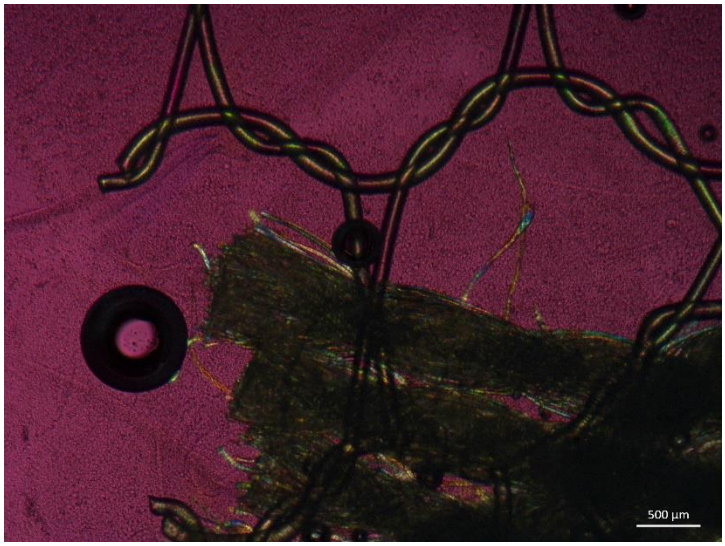


Fig. 8.3.2 Microscopy of residue - Sample 2

Sample 3 shows the solubilised substrate after Material 1 was solubilised in one beaker of deionised water (60˚C) (Fig. 8.3.3). The grainy appearance noted in Figures 8.3.1 and 8.3.2 is no longer visible, leaving only the nylon net substrate.

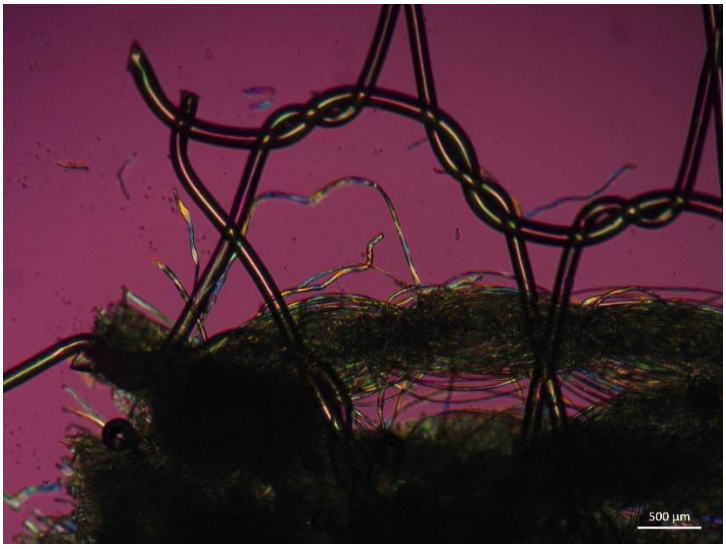


Fig. 8.3.3 Microscopy of residue - Sample 3

It was concluded that the substrate should be solubilised in two beakers of deionised water at 60˚C as outlined in the methodology. One to solubilise the substrate, and one to rinse through any traces of solubilised PVA.

8.4 Aesthetic Evaluation of the Supplementary Method

The technique outlined in section 8.2 was applied to KFRC Lace Piece B, as well as other materials noted in chapters 3 and 4. Due to time constraints, the various supports/infills were sewn around the edges only by couching (without laid thread) or button-hole stitch, using threads pulled from polyester Stabiltex®. With more time, additional stitching would have been implemented to secure the vulnerable edges of damaged areas using the most appropriate stitching method for the type of infill used. Therefore, the evaluation of the methods looked at their aesthetic qualities only. Before and after images illustrate the aesthetics of the technique (Fig. 8.4.1-8.4.12). These have been evaluated in a table for ease of making comparisons between methods under specific criteria (Table 8.4).

Fig. 8.4.1 Area of damage A before supporting.

Fig. 8.4.2 Area of damage A after supporting with a 20-denier nylon net patch.

Fig. 8.4.3 Area of damage B before support.

Fig. 8.4.4 Area of damage B after supporting with a silk net patch.

Fig. 8.4.5 Area of damage C before supporting.

Fig. 8.4.6 Area of damage C after supporting using silk crepeline.

Fig. 8.4.7 Area of damage D before supporting.

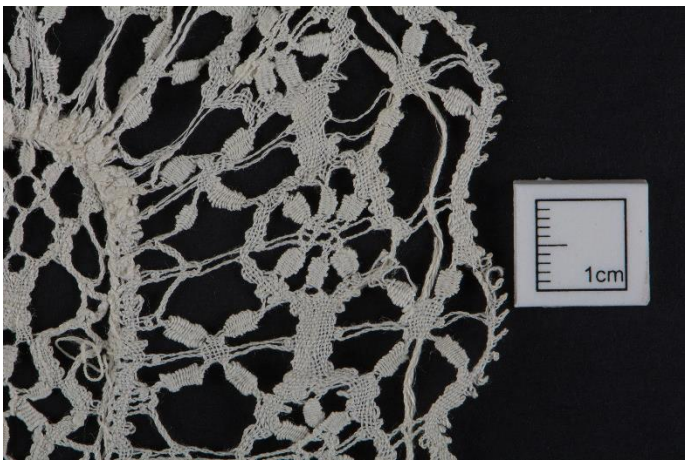


Fig. 8.4.8 Area of damage D after supporting with a thread bridge.

Fig. 8.4.9 Area of damage D (reverse) after supporting.

Fig. 8.4.10 Area of damage E before supporting.

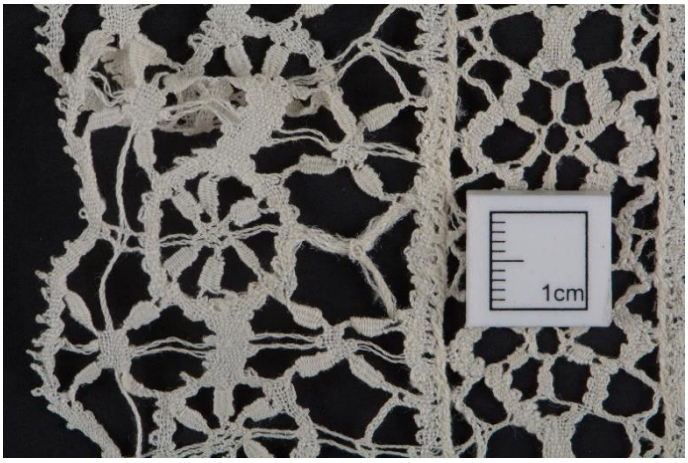


Fig. 8.4.11 Area of damage E after supporting using a machine-made guipure ground patch.

Fig. 8.2.12 Area of damage E (reverse) after supporting.

Table 8.4 Aesthetic evaluation of the supplementary method for KFLC Lace Piece B.

Area of Damage	Figures	Material	Patch/ Integrated/ Other	Stitching	Weight	Scale/pattern	Overall Aesthetics	Time (min)	Reversibility	Additional comments.
A	8.4.1-8.4.2	20 Denier nylon net.	Patch.	Couched using Stabiltex®.	Very light.	Different structure. Did not match.	Intrusive. Closes open-work of guipure structure. Visible on obverse.	90	Easily reversed.	Support fabric and object require tensioning before being sewn together. Net does not fray when cut.
B	8.4.3-8.4.4	Silk net.	Patch.	Couched using Stabiltex®.	Light.	Different structure. Did not match.	Intrusive. Closes open-work of guipure structure. Visible on obverse.	45	Easily reversed.	Support fabric and object requires tensioning before being sewn together. Net does not fray when cut.
C	8.4.5-9.4.6	Silk. Crepeline	Patch.	Couched using Stabiltex®.	Light.	Different structure.	Intrusive. Closes open-work of	60	Easily reversed.	Support fabric and object require

						Did not match.	guipure structure. Visible on obverse.			tensioning before being sewn together. Silk crepeline will fray.[64]
D	8.4.7-8.4.9	Two strands of embroidery floss.	Bridge.	Button-hole stitch.	Medium.	Sewn into position following the exact scale and pattern.	Non-intrusive. Retains open-work of guipure. Invisible on obverse.	30	Easily reversed.	Thread placement requires planning. Balance between choosing number of strands of thread to provide accurate infill but to avoid bulk.
E	8.4.10-8.4.12	Water-soluble material 1 and cotton thread.	Patch.	Staggered running stitch.	Medium.	Pre-made to match scale and pattern.	Non-intrusive. Retains open-work of guipure.	180	Easily reversed.	Sewing requires practice and careful judgement – how much stitching is

[64] A light layer of 5% Klucel G™ (cellulose based adhesive) was applied around the edges of a silk crepeline patch to prevent it from fraying and meant that turned edges were avoided as this made the patches even more noticeable.

							Invisible on obverse.			required to provide an accurate infill, but without over stitching, creating bulk.

8.5 Conclusion

Bringing together the results from various tests carried out in chapters 7 and 8, it can be concluded that PVA based materials 1 and 2 can be considered viable for use in the conservation of guipure ground structures. However, cellulose based water-soluble materials 3 and 4 are unsuitable. Microscopy has confirmed that water-soluble materials 1 and 2 do not leave behind residue, therefore there is no cause for concern with regards to volatile emissions recorded in the preceding chapter.

As well as having the ability to support broken connecting bars, a guipure ground infill has the potential to support and visually infill larger and denser areas of guipure ground without interfering with the open-work nature of the lace, which is difficult to achieve with many of the materials in current practice. Applying the 'six-foot, six-inch rule', the infill is unnoticeable from six feet, but is easily differentiated from the lace object at six inches.[65] Hand and machine-made lace appears orderly and calculated, whereas chemical lace, or lace produced using soluble substrates like materials 1 and 2, appears random, unorderly and uncalculated (Fig. 8.5.1).

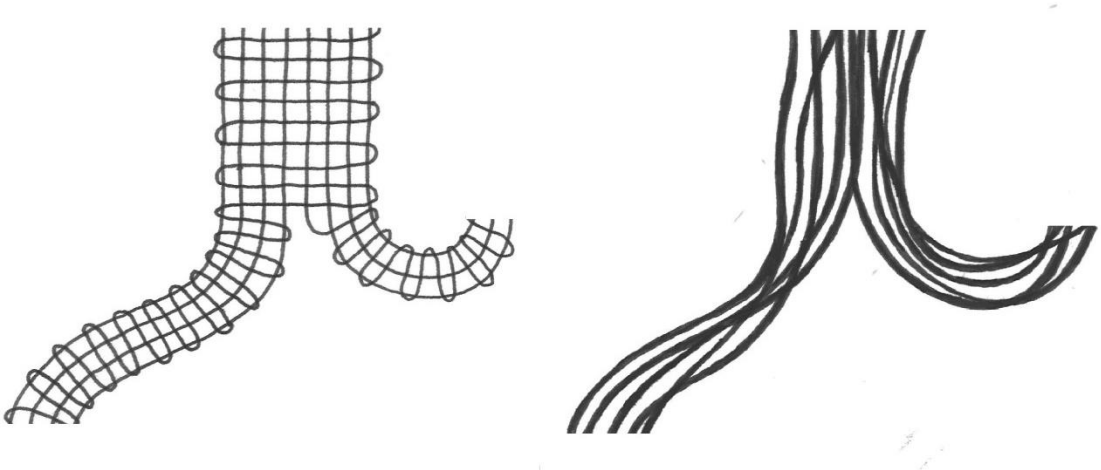


Fig. 8.5.1 Hand/machine-made lace (Left); Chemical/water-soluble lace (Right).

[65] "Digital Infills for a Carpet," V&A Conservation Journal Autumn 2009 Issue 58, http://www.vam.ac.uk/content/journals/conservation-journal/autumn-2009-issue-58/digital-in-fills-for-a-carpet/ (accessed July 31, 2017).

Due to the internal layer of nylon net, and disruption of sewn threads when the substrate is solubilised, the guipure ground infill can appear slightly napped, therefore mechanical action should be avoided. The method takes some practice to perfect, and is most effective on large areas of loss, but is perhaps not worth the time if only bridging one or two breaks in the connecting bars. The use of bridging with embroidery thread, or the various techniques explored by Elizabeth A. Kurella are worth exploring for smaller repairs. Many of the techniques in her book were not explored in the practical investigation due to the delayed access to her book which came from the United States.

Chapter 9 Conclusion

This dissertation has undertaken an evaluation of the various methods and techniques currently available to conservators of lace and has assessed, albeit at a high level, the research material available on this topic. It has identified the absence of the use of lace making hand-skills as a fundamental tool for lace conservators, strikingly simple as this option is. One would imagine that it would be foremost in the tool-kit of lace conservators as a basic knowledge of lace-making techniques must benefit them and inform their choices to better preserve the integrity of the objects on which they work.

Elizabeth M. Kurella, in her book 'Anybody Can Mend Lace and Linens' (2001), is deemed to provide the widest range of creative mending techniques that can be applied to all open-work textiles, including lace, and, in this reviewer's opinion, should be considered as a first point of reference for present day conservators.

There is, as stated above, a need to expand the methods and techniques available to lace conservators and it is considered that in certain cases a restorative approach, rather than a conservation approach, may be more suitable for preserving the true nature of the object while still following ethical conservation practice. In supporting this recommendation extensive case studies have been completed using samples of both 'net ground lace' and 'guipure ground lace' structures.

Two supplementary techniques were employed to address damage to net ground lace, namely net-darning and the use of a bobbin lace patch, and were evaluated alongside other methods in current use. All methods evaluated had advantages and disadvantages but, on balance, these additional techniques were found to produce a more accurate representation of the lace in question. It is further suggested that, while net-darning is best suited for supporting smaller areas of ground net, bobbin lace making is better suited to infill of a large area of loss, accurately representing the original structure of the missing lace.

In the case of guipure ground lace, the investigation centred on the use of water-soluble sewing substrates as a suitable method for conservation. Over-sewing, and the building up of layers of stitching, allows the threads to interlock and hold the overall shape together after the substrate is dissolved mimicking the guipure ground structure of the historic lace. Four water-soluble sewing substrates were examined using FTIR and Oddy testing, and their solubility and pH-values were also tested. The most suitable material, 100% PVA Sulky® Solvy film was then successfully applied to the guipure ground. It is suggested that this method is most effective for use on large areas of loss while bridging with embroidery thread, as suggested by Kurella, is possibly more appropriate for smaller areas of damage.

The studies outlined in this document have concluded that lace making hand-skills and the use of water-soluble sewing substrates are valuable techniques for the lace conservator and should be added to the existing selection of techniques currently available. The conclusions arrived at through these studies will be forwarded to NMS whose lace collars were the subject of this work.

Looking to the future, it is hoped to produce many more case studies and practical applications in order to build up a body of reference material on these techniques and to ensure that they become established and universally accepted methods.

To this end, it is proposed that a lace-making module would be a valuable addition to the curriculum for textile conservation study courses. Those who participated in the questionnaire survey which fed into this study indicated overwhelmingly that time and resources were the primary factors which influenced their decisions on the choice of support fabric and visual infill when conserving lace. If they possessed the basic hand-skills required, and the knowledge of the lace making technique, it is hoped that it would automatically prompt them to use these skills when the situation arises.

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Appendix I A Brief History of Lace

Lace dates from the late 15th Century. While is difficult to trace its origin from the very beginning however, early lace is believed to have originated from techniques such as pulled thread work and cutwork as well as lacis (darned net).[66] Although lace takes many forms today, bobbin and needle lace remain the two main branches, with machine-made lace developed more recently to imitate the two. Pat Earnshaw outlines that bobbin lace is a derivative of weaving and needle lace a derivative of embroidery.[67]

Literature surrounding which type of lace came first remains inconclusive. Historic paintings illustrating the use of lace suggest its earliest origins in Italy and Flanders around the turn of the 16th Century in the form of costume and furnishing embellishments.[68] While the fashion of lace patterns have changed, the underlying method and theory of both bobbin and needle lace have remained close to their early techniques.

The popularity of lace went through many declines and revivals. In the 17th Century, lace was used for trimmings and surface decoration, for furnishings and ecclesiastical use.[69] This early lace was heavy and densely worked, but as the fashion and trade of textiles in Europe changed, lace followed suit. Such changes led to the decline of heavy lace and development of lighter, airier lace featuring net ground.[70] By the end of the 17th Century, lace patterns began to feature three-dimensional forms seen in Venetian Rose Point lace (Fig. I.1) overleaf.[71] and tape based lace such as Milanese lace (Fig. I.2) overleaf.[72]

[66] Browne, *Lace,* 8.
[67] Earnshaw, *The Identification of Lace,* 8.
[68] Van der Meulen-Nulle, *Lace,* 7, 15.
[69] Toomer, *European Laces,* 22.
[70] Browne, *Lace,* 10.
[71] Toomer, *Lace,* 29.
[72] Toomer, *Lace,* 88.

Fig. I.1 Venetian Rose Point lace.

Fig. I.2 Milanese lace. c.1640-50.

The decline in heavy lace continued into the 18th Century, and the popularity of light weight lace that draped the body well grew popular for both men's and women's clothing.[73] The 18th Century saw technical advances in the making of lace on mainland Europe such as the development of raised edges seen in Brussels lace, and the hexagonal net ground, known as 'drochel' (Fig. I.3) overleaf.[74]

[73] Patricia Wardle, *Victorian Lace* (London: Herbert Jenkins, 1968), 7.
[74] Toomer, *Lace,* 113.

Fig. I.3 Mixed Brussels needle and bobbin lace edging. C.1860-1880.

France has a long history of lace making. Prior to the French Revolution (1789-1799) the quality of lace worn by men and women played a significant part in defining social class and status. Post French Revolution, lace was reserved for women's wear only, except for court or special occasions when it was acceptable to be worn by men. The aftermath of the French Revolution resulted in the decline of production and trade of lace throughout Europe. In exchange, there was a rise in popularity of Mousseline d'Inde (Indian muslin), influencing more simplistic fashion styles around Europe, while still featuring lace accents.[75]

Further decline of the lace industry was attributed to the Industrial Revolution which gave birth to the first lace machine, the Stocking frame (1764). Many lace machines superseded the Stocking frame, including the Warp frame (1775), the Bobbinet machine (1808), the Pusher (1812), and the Levers (1813). The range of machines had different functions that allowed for a variety of imitation laces, which flooded the market with affordable lace, and made it available to the lower classes. However, a common criticism of this was the undervaluing of hand-made lace.[76, 77]

[75] Wardle, *Victorian Lace,* 8-11.
[76] Earnshaw, *The Identification of Lace,* 17.
[77] Wardle, *Victorian Lace,* 18.

In the 19th Century, female dress was widely adorned with lace which decorated and accentuated the popular silhouettes of the time, including large skirts and voluminous sleeves. However, these large-scale fashions were short lived and fashion once again reduced in scale, and lace was limited to shawls, trimmings, narrow lappets, and other minor decorative motifs (Fig. I.4).[78, 79]

Fig. I.4 East Midlands Point lace shawl, c.1835-45.

Chemical lace, also referred to as 'Schiffli', 'Burnt' or 'Swiss' lace, was invented in 1880 between Switzerland and Germany. This technique took its inspiration from machine embroidery, and was used to imitate most types of lace. It was done by stitching a pattern to a substrate, usually silk, and dissolving the substrate in chlorine or caustic soda, whereby leaving the stitched open-work pattern behind.[80] Chemical lace is still made today using viscose rayon (Fig. I.5) overleaf. [81, 82]

[78] Browne, *Lace,* 8-14.
[79] Toomer, *Lace,* 154.
[80] Earnshaw, *The Identification of Lace,* 16, 134.
[81] "Chemical Lace Collar," Lace for Study, http://www.laceforstudy.org.uk/archives/purpose/2771/493-chemical-lace-collar/ (accessed July 31, 2017).
[82] "Guipure Chemical Lace," Gildebrief, www.gildebrief.de/SF7/contents/en-us/d155.html (accessed April 04, 2017).

Fig. I.5 Chemical lace, c. 1900-1915.

At the turn of the 20th Century, there was a growing interest in peasant lace.[83] Lace schools abounded to provide employment for women and children who made lace by hand which led to a short-lived revival for lace before its decline again in the face of the First World War.[84] Following both world wars, hand-made lace did not revive itself to the same level it had done in the past.

[83] Hand-made by the lower class. It was developed through government backing, and encouraged by philanthropic schemes.
[84] Earnshaw, *The Identification of Lace*, 16.

Appendix II Questionnaire Responses

Contributor 1

Please state your place of work.

Private practice

Public institution

Other

Please describe the object, stating the type and/or origin of lace if known.

Most of the objects come from the lace museum, so they are all lace (different types). Also, we have treated objects with some lace complements (costume).

Please provide the approximate date of treatment.

From 2005 until now.

Please describe the type(s) of structural damage/loss. E.g. holes/tear in net ground/densely worked motif.

Most of them had tears, holes, stains and weakness in the net ground. Others had broken threads in the decorative motifs.

Please describe the main aims of the treatment.

To physically stabilise the object.

Please describe the type of support treatment and material(s) used for the consolidation of damage/loss?

We use polyester/silk net, or cotton poplin as a support. We fix the areas with silk threads.

Please describe the rationale for your choice of treatment and material(s).

We tried different materials and these ones are the ones that we are most comfortable and we can find it easily.

Did you explore any alternative treatment(s) before choosing the method used? If yes, please outline alternative treatment method(s) tested. If no, please outline your reason(s) for not exploring alternative treatment methods.

We tried using cotton net but it is very thick and polyester/cotton threads that are thick as well. We tried with adhesives but we did not fix the original net completely.

Was the type and/or origin of lace considered an important factor when choosing the support treatment and materials? Please elaborate.

Yes. We used to work for museums and they have their own criteria. Some objects can stay flat, others must be hung.

Do you or have you ever made lace? If yes, please provide details. If no, why not?

No, I do not have time.

Upon reflection, is there any aspect of the treatment that you would have done differently today?

Not for the moment.

Please provide any further information you wish to add regarding the conservation treatment.

n/a.

Contributor 2

Please state your place of work.

Private practice

Public institution

Other

Please describe the object, stating the type and/or origin of lace if known.

a. Bobbin lace, probably Spanish ("blonda").

b. Bobbin lace, early 18th century.

Please provide the approximate date of treatment.

a. 2014.

b. 2015.

Please describe the type(s) of structural damage/loss. E.g. holes/tear in net ground/densely worked motif.

a. Very fragile: 50% of the net ground and motif was lost and the remainder was severely bundled and dislocated. Fortunately, the fibres from the foot side edge had not disintegrated, allowing to determine the total length of the lace strip.

b. Very fragile and fragmented: extremely dry fibres, dislocations, holes and tears in the net ground, loss of motifs.

Please describe the main aims of the treatment.

a. Consolidate and stabilise silk fibres. Provide a support that can carry and reshape the remaining lace.

b. Protect the lace from further loss. Keep associated fragments together to avoid dissociation.

Please describe the type of support treatment and material(s) used for the consolidation of damage/loss?

a. A mixture of MC and starch was used to consolidate the silk fibres. A silk net was used as a support; the lace was stitched with silk thread.

b. The lace was encapsulated/sandwiched between silk crepeline. Support lines were stitched with silk thread.

Please describe the rationale for your choice of treatment and material(s).

a. Aesthetics were an important consideration for the choice of treatment. Nylon net was considered too stiff. Other kinds of supports could lessen the "airy" and light aspect of the lace. However, the net allowed scissor cuts without having to make hems.

b. The appearance was not considered as important. The job had to be done quickly. The lace had to be protected from both sides. It was hard to consider other options because the lace was pleated.

Did you explore any alternative treatment(s) before choosing the method used? If yes, please outline alternative treatment method(s) tested. If no, please outline your reason(s) for not exploring alternative treatment methods.

a. and b. Not really, there was no time for testing.

Was the type and/or origin of lace considered an important factor when choosing the support treatment and materials? Please elaborate.

a. Yes, research was done to identify and learn about the origin of the lace. However, in the end, it did not seem to influence the choice of conservation treatment.

b. No, because the conservation treatment was seen as something temporary and it is hoped that a permanent solution can be completed soon.

Do you or have you ever made lace? If yes, please provide details. If no, why not?

Now I have, but not at the time that I treated these objects.

Upon reflection, is there any aspect of the treatment that you would have done differently today?

Yes, in both cases. I was not aware of the range of possibilities that exist when conserving lace at the time.

Please provide any further information you wish to add regarding the conservation treatment.

I am happy to share pictures if necessary.

Contributor 3

Please state your place of work.

Private practice

Public institution

Other

Please describe the object, stating the type and/or origin of lace if known.

I am not in a position to describe a specific treatment, but have worked on multiple types of lace from Ireland, Britain and the Continent.

Please provide the approximate date of treatment.

1995-2017.

Please describe the type(s) of structural damage/loss. E.g. holes/tear in net ground/densely worked motif.

Structural loss due to use, storage, insect damage, and display (pinning, staples).

Please describe the main aims of the treatment.

To conserve the object for display on a board, as part of costume, for handling / study and on occasion use (christening robe/ veil).

Please describe the type of support treatment and material(s) used for the consolidation of damage/loss?

Stitch support to a padded board, solid ground fabric, nylon or silk net.

Please describe the rationale for your choice of treatment and material(s).

Condition and role requested.

Did you explore any alternative treatment(s) before choosing the method used? If yes, please outline alternative treatment method(s) tested. If no, please outline your reason(s) for not exploring alternative treatment methods.

On occasion. However, alternatives are often limited by timescale and resources.

Was the type and/or origin of lace considered an important factor when choosing the support treatment and materials? Please elaborate.

The condition of the object was assessed together with the role requested.

Do you or have you ever made lace? If yes, please provide details. If no, why not?

Yes. Enlightening in terms of understanding structure but not essential for conservation of a lace object.

Upon reflection, is there any aspect of the treatment that you would have done differently today?

Conservation has developed greatly over the last 20 years. Detergents and cleaning methods have changed as have infill possibilities.

Please provide any further information you wish to add regarding the conservation treatment.

Due to client confidentiality and the Data Protection Act, I cannot discuss individual cases.

Contributor 4

Please state your place of work.

Private practice

Public institution

Other

Please describe the object, stating the type and/or origin of lace if known.

1. A family piece that had been used for several generations as a veil. It was brought to me for the next wedding to be held. (Since I have treated similar veils of many different styles).

2. In starting this I want to include a second, a silk, knitted lace shawl that was reportedly give to Harriet Tubman by Queen Victoria. A full analytical report was written during an earlier treatment.

Please provide the approximate date of treatment.

1. This one was in 2001.

2. 2016 (for the National Museum of African American History and Culture)

Please describe the type(s) of structural damage/loss. E.g. holes/tear in net ground/densely worked motif.

1. The veil was weak, too weak for the use planned.

2. The earlier treatment needed to be reverse as that it provided a backing to the two halves when folded, but not overall.

Please describe the main aims of the treatment.

Both were to clean and provide more support.

Please describe the type of support treatment and material(s) used for the consolidation of damage/loss?

1. I believe it was a plain weave material. I was not using net at the time.

2. I used Dukeries bobbin knitted net as a full backing.

Please describe the rationale for your choice of treatment and material(s).

1. The woven structure I felt was needed as I did not know how they were going to manipulate the veil onto the bride's head.

2. The sheerness of the net was critical. The shawl was to be folded diagonally, causing one of the sides to be visible though the net. The earlier treatment backed each of the triangles on the non-visible sides. No stitching was placed along either diagonal on either side. Only the perimeter. A woven fabric had been used during that earlier treatment.

Did you explore any alternative treatment(s) before choosing the method used? If yes, please outline alternative treatment method(s) tested. If no, please outline your reason(s) for not exploring alternative treatment methods.

No

Was the type and/or origin of lace considered an important factor when choosing the support treatment and materials? Please elaborate.

No

Do you or have you ever made lace? If yes, please provide details. If no, why not?

In my youth, I tatted extensively; I attempted to learn bobbin lace; I currently knit lace scarfs and incorporate various stitches into socks.

Upon reflection, is there any aspect of the treatment that you would have done differently today?

No

Please provide any further information you wish to add regarding the conservation treatment.

I have reports and images for the Tubman shawl if you are interested.

Contributor 5

Please state your place of work.

Private practice

Public institution

Other

Please describe the object, stating the type and/or origin of lace if known.

1828 wedding dress, with lace trim on cuffs and neckline

Please provide the approximate date of treatment.

2011-12

Please describe the type(s) of structural damage/loss. E.g. holes/tear in net ground/densely worked motif.

Losses in lace, yellow stains in areas, and generally yellowed.

Please describe the main aims of the treatment.

Reduce staining and yellowing, support lace for reinstatement to dress for display and exhibition tour

Please describe the type of support treatment and material(s) used for the consolidation of damage/loss?

Dyed nylon conservation net with adhesive and additional stitched support where necessary.

Please describe the rationale for your choice of treatment and material(s).

Nylon net is strong and most closely matched the lace, easy to work with, when cut it does not fray so edges can be left.

Did you explore any alternative treatment(s) before choosing the method used? If yes, please outline alternative treatment method(s) tested. If no, please outline your reason(s) for not exploring alternative treatment methods.

Not particularly for this object, but from past experience I knew patches would be difficult to conceal, and a whole support would be more appropriate for the demands of the exhibition tour.

Was the type and/or origin of lace considered an important factor when choosing the support treatment and materials? Please elaborate.

Only in terms of the structure of the lace.

Do you or have you ever made lace? If yes, please provide details. If no, why not?

No never. Seems very complicated and time consuming!

Upon reflection, is there any aspect of the treatment that you would have done differently today?

Perhaps explore other possible substrates for adhesive support.

Please provide any further information you wish to add regarding the conservation treatment.

Lace conservation can be tricky, especially to match the substrate with the lace whilst keeping a sense of the aesthetic value. The lace on this object was fairly narrow and so the treatment worked well, however, on a larger piece such as a shawl, another treatment may be more appropriate.

Contributor 6

Please state your place of work.

Private practice

Public institution

Other

Please describe the object, stating the type and/or origin of lace if known.

Various types including bobbin and needle lace from 17 to19th C.

Please provide the approximate date of treatment.

1970s to 2007

Please describe the type(s) of structural damage/loss. E.g. holes/tear in net ground/densely worked motif.

Holes and tears

Please describe the main aims of the treatment.

To stabilise the structure of the lace and visually improve the appearance.

Please describe the type of support treatment and material(s) used for the consolidation of damage/loss?

Stitched repair to nylon and or silk net.

Please describe the rationale for your choice of treatment and material(s).

Stitched support was more appropriate than an adhesive treatment. As far as possible cotton or linen lace was supported to a nylon net and silk to silk net. Also trying to match the shape of the net to best match support. This is not always possible but one wedding veil (19thc) had a diamond base net and I was able to find a modern silk net with almost the same size diamond pattern.

Did you explore any alternative treatment(s) before choosing the method used? If yes, please outline alternative treatment method(s) tested. If no, please outline your reason(s) for not exploring alternative treatment methods.

No

Was the type and/or origin of lace considered an important factor when choosing the support treatment and materials? Please elaborate.

As far as possible, the main consideration was to match the scale and size of the base net of the lace regardless of any other pattern or decoration.

Do you or have you ever made lace? If yes, please provide details. If no, why not?

No. The technique does not appeal to me.

Upon reflection, is there any aspect of the treatment that you would have done differently today?

No.

Please provide any further information you wish to add regarding the conservation treatment.

The treatments are not always visually ideal but the best possible with the materials and time available.

Contributor 7

Please state your place of work.

Private practice

Public institution

Other

Please describe the object, stating the type and/or origin of lace if known.

Lace panel.

Please provide the approximate date of treatment.

1992.

Please describe the type(s) of structural damage/loss. E.g. holes/tear in net ground/densely worked motif.

Lace panel was soiled but not structurally damaged.

Please describe the main aims of the treatment.

Clean and improve the appearance so support was not necessary.

Please describe the type of support treatment and material(s) used for the consolidation of damage/loss?

N/A

Please describe the rationale for your choice of treatment and material(s).

N/A

Did you explore any alternative treatment(s) before choosing the method used? If yes, please outline alternative treatment method(s) tested. If no, please outline your reason(s) for not exploring alternative treatment methods.

N/A

Was the type and/or origin of lace considered an important factor when choosing the support treatment and materials? Please elaborate.

N/A

Do you or have you ever made lace? If yes, please provide details. If no, why not?

Yes, but many years ago

Upon reflection, is there any aspect of the treatment that you would have done differently today?

No

Please provide any further information you wish to add regarding the conservation treatment.

N/A

Contributor 8

Please state your place of work.

Private practice

Public institution

Other

Please describe the object, stating the type and/or origin of lace if known.

This project was completed when I was a student at the University of Glasgow, textile conservation program. The object was pair of 17th century tabbed gauntlet gloves. The tabbed gauntlets and wrist ruff were edged with gold gilt metal lace. The origin of lace is not known however, it was thought that the gloves were an example of English costume.

Please provide the approximate date of treatment.

March-May 2016.

Please describe the type(s) of structural damage/loss. E.g. holes/tear in net ground/densely worked motif.

The main issue with the lace was that it was heavily crumpled which disfigured the construction of the lace. Previous attempts (by another conservator) were made to humidify the lace, which showed to cause tarnishing to the metal.

Please describe the main aims of the treatment.

Due to the fact that the metal lace could not be humidified, the aim of the treatment became recreating the lace. This was done so researchers and students could interpret the lace without handling the object.

Please describe the type of support treatment and material(s) used for the consolidation of damage/loss?

N/A

Please describe the rationale for your choice of treatment and material(s).

N/A

Did you explore any alternative treatment(s) before choosing the method used? If yes, please outline alternative treatment method(s) tested. If no, please outline your reason(s) for not exploring alternative treatment methods.

N/A

Was the type and/or origin of lace considered an important factor when choosing the support treatment and materials? Please elaborate.

N/A

Do you or have you ever made lace? If yes, please provide details. If no, why not?

Yes. I serendipitously met several lace researchers and makers through another classmate. One of them was a published metal lace historian and maker. She was able to make patterns of the lace and provided a sample of the more complicated lace. I was able to take a lace making class and learned how to make a more simple piece of lace from the pattern she created.

Upon reflection, is there any aspect of the treatment that you would have done differently today?

N/A

Please provide any further information you wish to add regarding the conservation treatment.

N/A

Contributor 9

Please state your place of work?

Private practice

Public institution

Other

Please describe the object, stating the type and/or origin of lace if known.

Lace trim to an oyster grey taffeta dress dating from 1825-1830. The lace is a fine silk net embroidered in silk, 5cm deep. The lace was originally attached to the neckline by three different methods; 12mm pleats, more relaxed pleating and gathers. When extended it was almost 5 metres in length.

Please provide the approximate date of treatment.

November 2009 - March 2010.

Please describe the type(s) of structural damage/loss. E.g. holes/tear in net ground/densely worked motif.

The lace was extremely fragile with splits and holes. It was detached from the dress in places and was very crumpled. It had yellowed. The silk embroidery was largely secure. The dress, as a whole, had been given an urgent treatment rating due to its fragile condition.

Please describe the main aims of the treatment.

To enable the lace to be presented as it would have been originally; sitting up from the neckline. To humidify and clean the lace. To support the fragile lace to prevent further damage and deterioration through handling and allow the dress to go on short term display.

Please describe the type of support treatment and material(s) used for the consolidation of damage/loss?

The lace was removed from the dress, humidified and wet cleaned before being supported onto dyed conservation net. The lace was laid on top of the net and attached using lines of running stitch, in a fine Egyptian cotton thread. The stitches were set at an angle through the embroidered decoration along a grain line of the net and lace. The most damaged areas were sandwiched between two layers of net. Running stitches

were also worked down the edges to secure them before the net support was trimmed back. The original line of gathers was also reinstated.

Please describe the rationale for your choice of treatment and material(s).

The lace was too fragile to support itself. Conservation net worked well, visually replicating the silk net and gave the lace strength to enable it to be handled, re-pleated and gathered and reattached.

Did you explore any alternative treatment(s) before choosing the method used? If yes, please outline alternative treatment method(s) tested. If no, please outline your reason(s) for not exploring alternative treatment methods.

There were discussions around how to stitch the net as the thread would be seen. It was decided that doing angled, diagonal lines worked best with the design and gave an even support. To have stitched around the embroidery would have confused the design. The lace was to be pleated and gathered so the lines were not visually disturbing.

Was the type and/or origin of lace considered an important factor when choosing the support treatment and materials? Please elaborate.

Conservation net was considered a good choice as the original was a net lace. The stitching was done in a fine Egyptian cotton thread which matched the original silk thread very well. It was decided that this would be stronger than a fine silk thread.

Do you or have you ever made lace? If yes, please provide details. If no, why not?

I have not made lace. Not sure why! I have concentrated on other textile techniques, mainly embroidery, but would like to try it in the future!

Upon reflection, is there any aspect of the treatment that you would have done differently today?

I am happy with the treatment.

Please provide any further information you wish to add regarding the conservation treatment.

N/A

Contributor 10

Please state your place of work.

Private practice

Public institution

Other

Please describe the object, stating the type and/or origin of lace if known.

Chemise by Therese Blanchet, French, 1923; gold lamé front and back panels with wide bands of metallic lace at top, bottom and sides. Lace bands are comprised of a net ground made from silk yarns wrapped in plated metal; this net is embellished with a supplementary hammered, multi-ply wrapped-core yarn.

Please provide the approximate date of treatment.

November 2016.

Please describe the type(s) of structural damage/loss. E.g. holes/tear in net ground/densely worked motif.

Several tears and minor losses in net ground.

Please describe the main aims of the treatment.

Quickly stabilize tears and minor losses to prevent further damage during exhibition.

Please describe the type of support treatment and material(s) used for the consolidation of damage/loss?

Nylon net underlay in sympathetic color (sic), stitched with dyed-to-match hair silk thread.

Please describe the rationale for your choice of treatment and material(s).

We needed a quick solution for an object that was added to our exhibition list very close to installation time. The garment (a very two-dimensional 1920s silhouette constructed of two rectangles with shoulder straps) would be displayed flat, mounted to a slanted board, and would not need to withstand the stress of gravity on a dress form. For this reason, we selected a net underlay to provide fast, straightforward, and visually unobtrusive support in a narrow time frame.

Did you explore any alternative treatment(s) before choosing the method used? If yes, please outline alternative treatment method(s) tested. If no, please outline your reason(s) for not exploring alternative treatment methods.

No; did not have luxury of doing this due to exhibition schedule and other time constraints.

Was the type and/or origin of lace considered an important factor when choosing the support treatment and materials? Please elaborate.

Yes; net ground lent itself to this particular support technique.

Do you or have you ever made lace? If yes, please provide details. If no, why not?

Yes; have experimented with various forms of lacemaking over the years, for fun and as part of my conservation training, including bobbin and needle lace

Upon reflection, is there any aspect of the treatment that you would have done differently today?

No, not in this case

Please provide any further information you wish to add regarding the conservation treatment.

N/A

Contributor 11

Please state your place of work.

Private practice

Public institution

Other

Please describe the object, stating the type and/or origin of lace if known.

Balenciaga evening dress. Machine lace. c.1960.

Please provide the approximate date of treatment.

April 2017.

Please describe the type(s) of structural damage/loss. E.g. holes/tear in net ground/densely worked motif.

Tearing and holes in net ground, especially at the upper skirt due to weight pulling down.

Please describe the main aims of the treatment.

To allow the dress to be displayed on a mannequin without further damage.

Please describe the type of support treatment and material(s) used for the consolidation of damage/loss?

Custom dyed nylon bobbin-net. Sewn in place with Polyester Mara 220 and threads pulled from Stabiltex®.

Please describe the rationale for your choice of treatment and material(s).

The bobbin net was a relatively close match for the ground net of the machine lace. It also allowed for drape and movement. The repair was done in situ, between the layers of the dress so sewing rather than adhesive was chosen.

Did you explore any alternative treatment(s) before choosing the method used? If yes, please outline alternative treatment method(s) tested. If no, please outline your reason(s) for not exploring alternative treatment methods.

Adhesive was discounted due to problems with access.

Was the type and/or origin of lace considered an important factor when choosing the support treatment and materials? Please elaborate.

Yes, the machine lace had a net ground.

Do you or have you ever made lace? If yes, please provide details. If no, why not?

Yes, I have made bobbin lace and needle lace as part of my conservation training.

Upon reflection, is there any aspect of the treatment that you would have done differently today?

No.

Please provide any further information you wish to add regarding the conservation treatment.

N/A

Contributor 12

Please state your place of work.

Private practice

Public institution

Other

Please describe the object, stating the type and/or origin of lace if known.

Mantilla, machine-made black silk. Late 19th-early 20th century. Belonged to American opera singer Ruth Thayer-Burnham.

Please provide the approximate date of treatment.

2017.

Please describe the type(s) of structural damage/loss. E.g. holes/tear in net ground/densely worked motif.

Several small holes were present where one element in the bobbinet structure was broken. One larger tear. Overall distortion and wrinkling.

Please describe the main aims of the treatment.

Mount for display and preservation

Please describe the type of support treatment and material(s) used for the consolidation of damage/loss?

Black cotton thread, cotton-covered padded solid-support panel, UV-filtering acrylic box.

Please describe the rationale for your choice of treatment and material(s).

Low-impact, high-visual results. Object is from our study collection and we had the supplies left over from another project.

Did you explore any alternative treatment(s) before choosing the method used? If yes, please outline alternative treatment method(s) tested. If no, please outline your reason(s) for not exploring alternative treatment methods.

We considered repairing the lace first and then mounting it. However, the relative fragility of the silk under tension was unknown. Likewise, we would not have been able

to make an invisible repair that would have held up after the mantilla was tensioned for mounting.

Was the type and/or origin of lace considered an important factor when choosing the support treatment and materials? Please elaborate.

No.

Do you or have you ever made lace? If yes, please provide details. If no, why not?

Crochet and lace knit scarves.

Upon reflection, is there any aspect of the treatment that you would have done differently today?

No.

Please provide any further information you wish to add regarding the conservation treatment.

When conserving lace on a garment, we of course do the repairs without incorporating a mounting system. In that case we will use nylon or silk net for added stability.

Contributor 13

Please state your place of work.

Private practice

Public institution

Other

Please describe the object, stating the type and/or origin of lace if known.

Collections of needle and bobbin lace.

Please provide the approximate date of treatment.

From the late 1980's onwards .

Please describe the type(s) of structural damage/loss. E.g. holes/tear in net ground/densely worked motif.

This has varied from "raw" edges to tears and missing sections.

Please describe the main aims of the treatment.

To make safe for storage or display.

Please describe the type of support treatment and material(s) used for the consolidation of damage/loss?

For flat lace generally, a solid fabric that the lace can be seen against if for display or unbleached cotton calico for storage. For three-dimensional lace or net would be used dyed (occasionally un-dyed) nylon net.

Please describe the rationale for your choice of treatment and material(s).

For flat lace on display, would use a solid fabric so that the design in the lace can be seen. For storage if the lace is small enough would not stitch the lace to the support but, have it in loose so that both sides can be seen. For three-dimensional lace objects with a net background, would use net to keep the shape and drape of the lace. If lace did not have a net background would look at other fabrics that gave the drape required.

Did you explore any alternative treatment(s) before choosing the method used? If yes, please outline alternative treatment method(s) tested. If no, please outline your reason(s) for not exploring alternative treatment methods.

Availability of fabrics in the timescale would limit which were chosen.

Was the type and/or origin of lace considered an important factor when choosing the support treatment and materials? Please elaborate.

Yes, would not use net for needle lace as it moves in the wrong way.

Do you or have you ever made lace? If yes, please provide details. If no, why not?

Yes, bobbin lace at the TCC and one or two small strips since.

Upon reflection, is there any aspect of the treatment that you would have done differently today?

Would want to get storage cabinets for the lace, much of it has not had a permanent home and has had to be packed it trays for transport. Part of the collection has been photographed, would like to get the rest done so that it becomes easier to access and research - have seen some wonderful photographs and drawings in an online exhibition 2-3 years ago so for future displays would want to have detailed photographs but, would have to plan those into any treatment.

Please provide any further information you wish to add regarding the conservation treatment.

The purpose of the collections and the brief for display or storage have a big effect of choice of treatment. The white colour and detail make lace difficult to display, as well as photograph. I would be interested in different lighting, would like to see if raking light would work in an exhibition and being able to use really low reflectance glass so that people could get very close to the lace.

Contributor 14

Please state your place of work.

Private practice

Public institution

Other

Please describe the object, stating the type and/or origin of lace if known.

Chemisette.

Please provide the approximate date of treatment.

August 2014

Please describe the type(s) of structural damage/loss. E.g. holes/tear in net ground/densely worked motif.

Folds, tears in net ground, puled threads, area of loss in the motif.

Please describe the main aims of the treatment.

Stabilize the object for vertical display in temporary exhibition.

Please describe the type of support treatment and material(s) used for the consolidation of damage/loss?

Consolidation of tear with nylon net and couching stitches/running stitches with silk thread.

Please describe the rationale for your choice of treatment and material(s).

The chemisette is made of cotton net and machine-made cotton lace. The areas of consolidation were on both materials. Therefore, the net was aesthetically the best option and mechanically strong enough to support the tears once the object on vertical display. I did use silk thread as it was strong enough but not sharp as the net and lace were really worn and could have broken with the use of a Skala thread for example.

Did you explore any alternative treatment(s) before choosing the method used? If yes, please outline alternative treatment method(s) tested. If no, please outline your reason(s) for not exploring alternative treatment methods.

I didn't explore other alternative treatments as I don't think any other support material would have worked well with this object. For mechanical and aesthetical reasons explained above.

Was the type and/or origin of lace considered an important factor when choosing the support treatment and materials? Please elaborate.

It was a factor I took in consideration. If the object was originally made of silk net (it wasn't the case mine was made of cotton) I would have consider silk net option for my consolidation in order to match the shiny surface (but it might not have worked!). I would say it is mainly its condition and fragility that made me choose the nylon one as it is stronger and easier to work with as it is slightly more rigid.

Do you or have you ever made lace? If yes, please provide details. If no, why not?

I had one week training in lace making during my conservation training in Paris at the Institut National du Patrimoine with a professional lace maker.

Upon reflection, is there any aspect of the treatment that you would have done differently today?

No.

Please provide any further information you wish to add regarding the conservation treatment.

N/A

Contributor 15

Please state your place of work.

Private practice

Public institution

Other

Please describe the object, stating the type and/or origin of lace if known.

Bobbin and needle lace trimmings on christening robe.

Please provide the approximate date of treatment.

Summer 2016.

Please describe the type(s) of structural damage/loss. E.g. holes/tear in net ground/densely worked motif.

Tears and holes in bobbin lace. Unravelling threads in needle lace.

Please describe the main aims of the treatment.

To stabilise the robe sufficiently for it to be used for a christening.

Please describe the type of support treatment and material(s) used for the consolidation of damage/loss?

Polyester filament threads (drawn from Stabiltex), polyester sewing thread and nylon net patches.

Please describe the rationale for your choice of treatment and material(s).

Strength and durability, invisibility.

Did you explore any alternative treatment(s) before choosing the method used? If yes, please outline alternative treatment method(s) tested. If no, please outline your reason(s) for not exploring alternative treatment methods.

No. Methods tried and tested successfully many times before.

Was the type and/or origin of lace considered an important factor when choosing the support treatment and materials? Please elaborate.

Type yes, origins no. The same techniques (and thus structure) are used in different periods and places so the problems tend to be similar no matter what the object's origins. Choice of support method focused on type, i.e. structure.

Do you or have you ever made lace? If yes, please provide details. If no, why not?

Yes, bobbin and needle. This has helped my understanding of the structures and how they behave and exhibit damage, and thus how my support stitching should integrate with the original.

Upon reflection, is there any aspect of the treatment that you would have done differently today?

No.

Please provide any further information you wish to add regarding the conservation treatment.

N/A

Contributor 16

Please state your place of work.

Private practice

Public institution

Other

Please describe the object, stating the type and/or origin of lace if known.

17th century bobbin lace bertha from the effigy of Mary II – Westminster Abbey. Lace is likely to have come from another object/been made for a different purpose then incorporated into the costume when the effigy was commissioned on her death in 1694. Much of the costume used on the funeral effigies is on its second life having either been worn by the monarch or procured/doctored from another item of clothing/theatre costume for the effigy (although there are a number of examples where the garment was made specifically for the effigy). Lace had been stitched onto a cotton strip of fabric (presumably in the 1980s when the objects were previously conserved on mass) which then tucked into the top of the bodice allowing the lace to fold over to the bodice face.

Please provide the approximate date of treatment.

June 2017

Please describe the type(s) of structural damage/loss. E.g. holes/tear in net ground/densely worked motif.

Lace was very weak and many of the fine ground lace bars were broken leaving numerous small and a few large areas of structural damage. The lace had been wet and dry cleaned and bleached on more than one occasion and was in a poor condition. Lace had been heavily restored with many breaks darned or knotted back together with fine cotton(?) thread.

Please describe the main aims of the treatment.

Lace required full support for display and aesthetic infill for areas of loss. The effigies are going into a new museum in the Abbey in 2018 and great emphasis has been placed on improving their visual appearance.

Please describe the type of support treatment and material(s) used for the consolidation of damage/loss?

Dyed Dukeries nylon net stitched in place with Stabiltex®. Lace removed from cotton strip to allow full support. Net support was cut and edges were turned inwards on the three sides not attached to the cotton strip (net edge attached to cottons strip cut flush with object to prevent adding extra bulk). Damaged areas of lace were stitched around as and where necessary. Lines of staggered running stitch added at regular intervals to fully support lace onto net. Edges of lace secured onto net with long and short blanket stitch. Supported lace re-applied onto cotton strip with herringbone stitch in colour matched Gütermann 220 Mara thread.

Please describe the rationale for your choice of treatment and material(s).

This is a tried and tested method of support for lace which had been used in the studio on numerous occasions. I consulted an experienced colleague on best choice of materials taking into consideration what was available in the studio and allotted time for the treatment. Net supports without concealing and, when dyed to match the object, softens the visual impact of areas of loss in the design.

Did you explore any alternative treatment(s) before choosing the method used? If yes, please outline alternative treatment method(s) tested. If no, please outline your reason(s) for not exploring alternative treatment methods.

No – net was my only choice of support material (for reasons mentioned above). I considered Gütermann Skala as an alternative stitching material but on holding threads against the object decided that Stabiltex® would prove less visually intrusive. Lace making/restoration techniques were not considered due to the fineness of the lace, quantity of damage, my lack of lace-making ability and time allotted. Most importantly, the lace itself was extremely weak and previous areas of darning and knotting looked to be causing further structural damage (although removing them all at this stage was not a realistic option) so support was the priority.

Was the type and/or origin of lace considered an important factor when choosing the support treatment and materials? Please elaborate.

Yes, in so much as the support materials were matched to the weight of the lace and detail of design was considered when discussing the visual end result of the treatment.

Different materials/methods may have been more appropriate for a heavier raised needlepoint for instance. The origin was not really a consideration – the object may have been sourced from any number places and without further details on when/how objects had been pooled together to the dress the effigies we took quite a non-interventive approach with the lace.

Do you or have you ever made lace? If yes, please provide details. If no, why not?

Yes – I wrote my Understanding Textile poster on needlepoint lace at the CTC and attempted to make a small example.

Upon reflection, is there any aspect of the treatment that you would have done differently today?

Yes – the supported lace was stitched back onto the cotton strip as before but in retrospect I would have not cut the top edge of my support net flush to the lace and used this as a hinge instead between the lace and the cotton strip, therefore the lace would not be folded back on itself on installation. The net was successful as a support material and Stabiltex® is strong and disappears well into the object. I would be interested to know about other support methods as it seems that there are few more successful alternatives to this at present.

Please provide any further information you wish to add regarding the conservation treatment.

N/A

Contributor 17

Please state your place of work.

Private practice

Public institution

Other

Please describe the object, stating the type and/or origin of lace if known.

Maltese/Cluny lace handkerchief

Please provide the approximate date of treatment.

1985

Please describe the type(s) of structural damage/loss. E.g. holes/tear in net ground/densely worked motif.

The lace was a very loose structure and ends had worn loose possibly in places. There was some staining the cause of which had caused the silk thread to deteriorate and lead to breaks. The stitching holding different sections of the lace together had also worn loose in places.

Please describe the main aims of the treatment.

To support the weak areas and mount the object for the TCC reference collection.

Please describe the type of support treatment and material(s) used for the consolidation of damage/loss?

The handkerchief was given a full support of silk crepeline. The crepeline was washed in warm water to remove some of the seracin. A monofilament silk thread was used to couch weak areas of the central plain-woven silk circle. Reverse herringbone was worked round the silk area to attach it to the crepeline. Where the stitching holding the pieces of lace was coming undone the stitches were reinstated. Where there was no thread the lace was secured with reverse herringbone. In lace areas, the threads were disentangled and rewoven back into position as closely as possible and secured with couching. There was very little thread actually missing.

Please describe the rationale for your choice of treatment and material(s).

It was important to choose a support that suited the open and delicate structure of the lace. Silk crepeline was more sympathetic than nylon net which was thought to be a bit abrasive and the crepeline did not obscure the lace to and unacceptable level. Silk thread was also sympathetic. Stabiltex® would have been an alternative, Skala was too thick.

Did you explore any alternative treatment(s) before choosing the method used? If yes, please outline alternative treatment method(s) tested. If no, please outline your reason(s) for not exploring alternative treatment methods.

I considered only supporting the central silk area but then realised the lace also required support. Sandwiching the object was also considered but it was decided that the object wasn't weak enough to need this. Sandwiching would also have changed the character of the object too much and would have obscured the lace too much.

Was the type and/or origin of lace considered an important factor when choosing the support treatment and materials? Please elaborate.

I really don't remember, I don't think so.

Do you or have you ever made lace? If yes, please provide details. If no, why not?

There were a few introductory sessions to lace making as part of my course at the TCC. I have also had some experience of needle lace which I used when I was doing my degree in textile design and at this stage I really taught myself.

Upon reflection, is there any aspect of the treatment that you would have done differently today?

I may have just supported the central area and found a way of securing the lace without needing a support although giving the whole object support has probably made the object safer for handling and storage. The object is part of a study collection. If the object had been prepared for display I might have done things differently.

Please provide any further information you wish to add regarding the conservation treatment.

N/A.

III.1 NMS Lace Piece A

Object Record

Object/Museum Number: H RHD 27

Date: c. 19th Century

Brief Description: Woman's cream lace collar.

Two layers of pleated straight/continuous lace: embroidered net with scalloped edges, forming a round-necked collar with an on opening at the back.[85] There are 32 repeated embroidered embellishments on the upper layer, and 28 on the lower layer.

Fig. III.1.1 NMS Lace Collar A obverse.

Museum number: H RHD 27. Image by kind permission of National Museums Scotland.

[85] Toomer, *European Laces,* 22.

Dimensions:

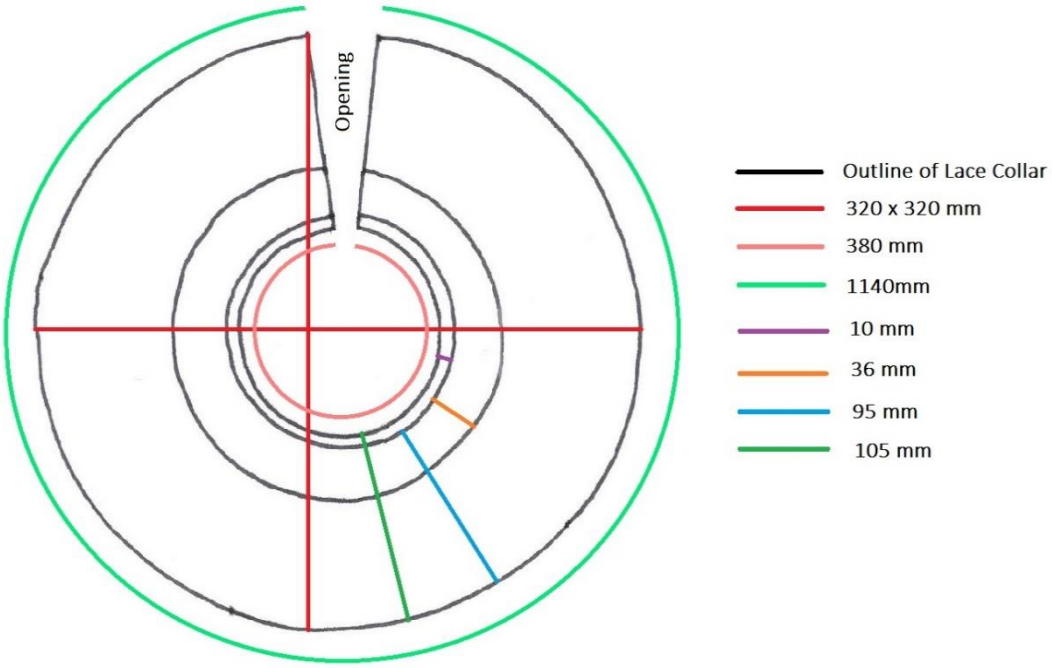


Fig.III.1.2 NMS Lace Collar A dimensions.

Orientation:

Opening of lace collar situated to the back of wearer (Fig. III.1.2).

Materials:

Cotton net, embroidery 'gimp' thread and sewing thread.[86]

Technique of Construction:

Machine-made net. Technically similar to hand-made East-Midlands and Lille lace.[87] Machine-made observation made by uniformity of net structure throughout, and examination of selvage edge. Typical hexagon shaped net, with a set pattern of twists of the treads (Fig. III.1.3).

[86] Materials assumed to be cotton based on visual examination only. Fibre ID was not permitted during the study visit.
[87] Toomer, *Lace,* 155.

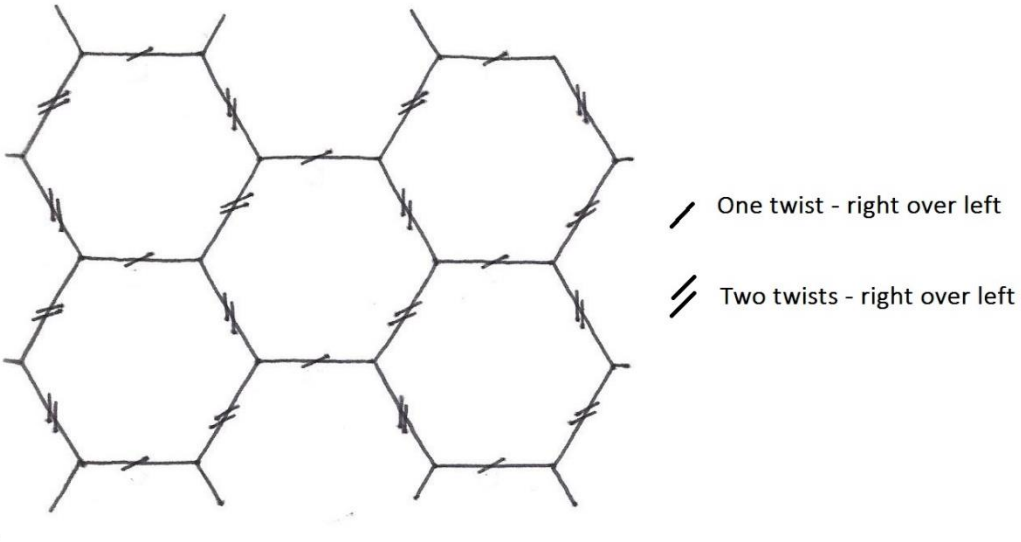


Fig. III.1.3 Twisted thread formation of net ground.

Needle-run embroidery embellishments are applied using thick 'S' twist gimp thread. This is made evident by examining how the tread is drawn in and out of the net ground which cannot be achieved with a machine. The same thread is used to define and weigh down the scalloped edges of both the upper and lower layers of lace. This is worked through the net ground in the same needle-run technique.[88]

The upper and lower layers are pleated, forming a curved edge, by overlapping the net on itself at a depth of approx. 5mm. The upper and lower layers are pleated slightly differently and with different spacing between each pleat also.

Box-pleats are worked on the upper layer, two equal folds are directed away from each other. Standard pleats are worked on the lower layer, each fold is directed to the left.

The neckline of the collar is made from a folded length of plain net lace worked in the same principle as bias binding to encase the upper and lower layers. All three elements are united together with machine stitching, made evident by the uniformity of stitch length, tension and straightness.

Attribution/Provenance:

Acquired by the museum in 1968.[89]

[88] Toomer, *Lace,* 77.
[89] Information provided by NMS. No further information sought.

Condition Report

Overall Condition:

Fair: Some ingrained soiling/staining, structural damage, and fibre degradation. Distorted in areas, and has a crisp handle.

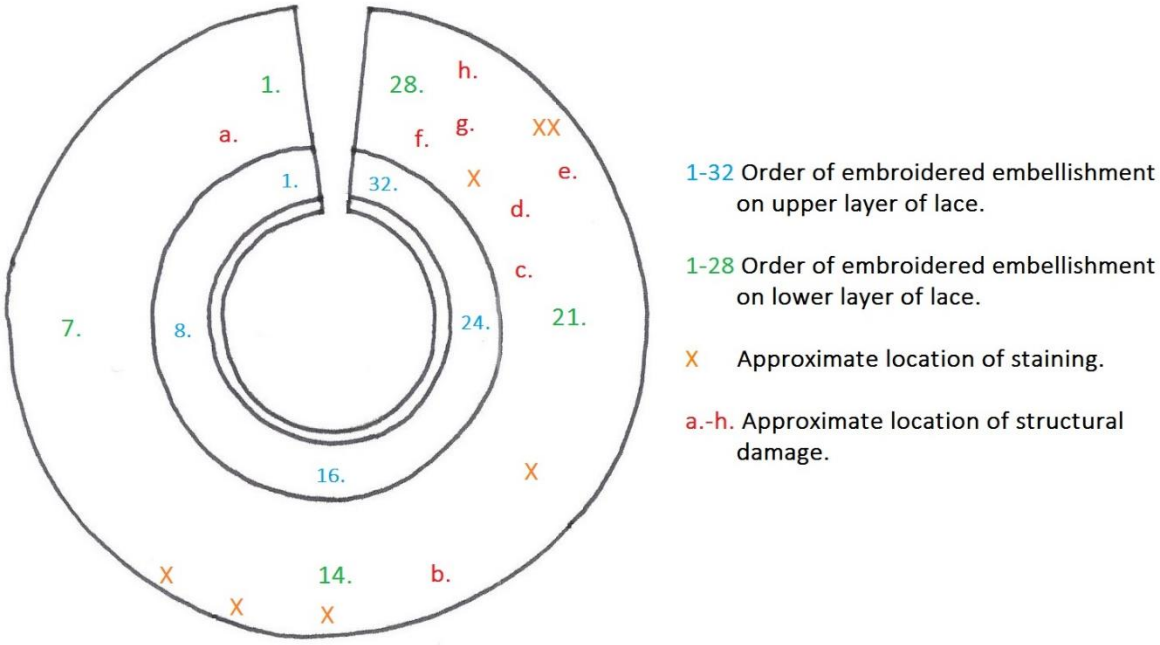


Fig. III.1.4 NMS Lace Collar A condition details.

Condition Details

Discolouration: The lace collar is discoloured to a yellow tone evenly throughout, including both net and embroidered elements. Such discolouration is typical of cellulose degradation, a sign of acidity in the fibres, which is also a contributing factor to its overall mechanical strength and rigidity.[90]

Soiling: There is little particulate soiling. Some foreign fibres are loosely bound within the net structure.

[90] Tímár-Balázsy, *Chemical Principles of Textile Conservation,* 36.

Staining: There are areas of unidentified orange staining. It is possible that these areas are also a result cellulose degradation at a more developed stage. Such staining is mostly found on the lower layer of the lace collar around the 12th, 13th, 14th, 19th, and 24th embroidered embellishment. The 24th is the most defined and darkest in colour, and very crisp to the touch (Fig III.1.4).

Distortion: The lace collar is heavily distorted, particularly the upper layer, and edges of the lower layer at the opening of the collar. Their crumpled appearance may have been caused by storage or wear. The upper layer may have been in contact with another outer layer of clothing that may have disturbed and distorted the lace (Fig. III.1.1).

Creasing: As previously mentioned, intentional creasing occurs in the form of pleating around the neck-line of both layers of lace. Unintentional creasing occurs around the perimeter of lower layer of lace along the scalloped edge. Again, this is most likely caused by insufficient storage space and or wear (Fig. III.1.1).

Structural damage: Fine lace threads have fractured, resulting in eight main holes in the net ground, varying in size (Fig. III.1.4). These are most likely caused from catching or overzealous handling. The areas of structural damage are located in the following areas:

a. Between the 3rd and 4th embroidery embellishment (EE), measuring approx. 3x8mm.
b. Between the 15th and 16th EE, measuring approx. 3x3mm.
c. Between the 21st and 22nd EE, measuring approx. 5x5mm.
d. Between the 26th and 27th EE, measuring approx. 5x7mm.
e. Between the 26th and 27th EE, measuring approx. 4x4mm.

f. Between the 27th and 28th EE, measuring approx. 3x3mm.

g. Between the 27th and 28th EE, measuring approx. 9x9mm.

h. Between the 27th and 28th EE, measuring approx. 8x10mm.

Weakness: The edge of the lace collar before EE 1 on the upper layer is frayed, and is at risk of unravelling, spreading the area of damage (Fig. III.1.4).

Previous Repairs: N/A

III.2 NMS Lace Piece B

Object Record

Object/Museum Number: A.1993.148

Date: c. 1890

Brief Description: Woman's cream lace collar.

A continuous piece of openwork bobbin tape, semi-straight lace.[91] No openings or fastenings. Geometric shaped outline with straight foot-side edges. Circular neckline featuring scalloped picot edging.

Fig. III.2.1 NMS Lace Collar B obverse

Museum number: A.1993.148. Image by kind permission of National Museums Scotland.

[91] Toomer, *European Laces,* 23.

Dimensions:

Maximum (L x W x H): 250mm x 280mm x 20mm

Outer circumference: 1200mm

Inner circumference: 640mm

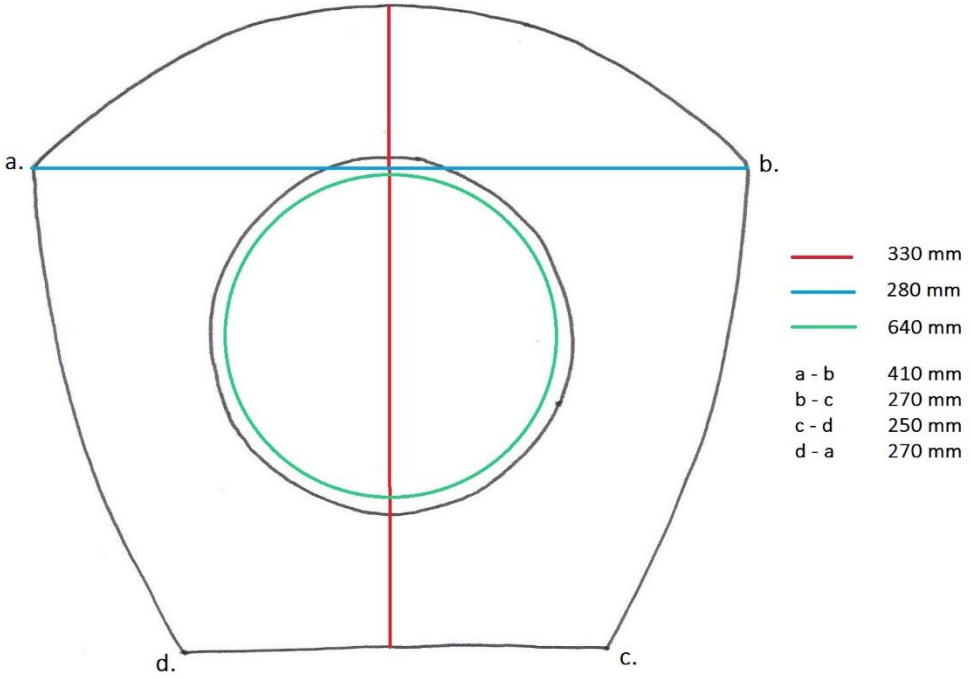


Fig. III.2.2 NMS Lace Collar B dimensions.

Orientation:

Curved edge situated to the back of the wearer.

Materials:

Cotton.[92]

[92] Material assumed to be cotton based on visual examination only. Fibre ID was not permitted during the study visit.

Technique of Construction:

Traditional guipure openwork bobbin tape lace - woven tape waves joined by various ground fillings such as plaits and leaf shaped tallies. 'S' twist threads are used throughout. [93] Inner circumference is decorated with a delicate picot edging.[94]

Possible combination of hand-made Bedfordshire lace and or Maltese lace in style and technique, worked from a pricking pattern.[95]

Attribution/Provenance:

Acquired by the museum in 1993. Collected and/or made in Portsoy, Scotland.[96]

[93] "Tallies," Jean Leader Lace Maker and Textile Enthusiast, https://www.jeanleader.co.uk/techniques/leaftallies.html (accessed June 21, 2017).
[94] Wright, *Bobbin Lace Making,* 70-71.
[95] Toomer, *Lace,* 171-173, 176-179.
[96] Information provided by NMS. No further information sought.

Condition Report

Overall Condition:

Fair: Some ingrained soiling/staining, one large area of structural damage, fibre degradation. Slight distortion, and crisp handle (Fig. III.2.3).

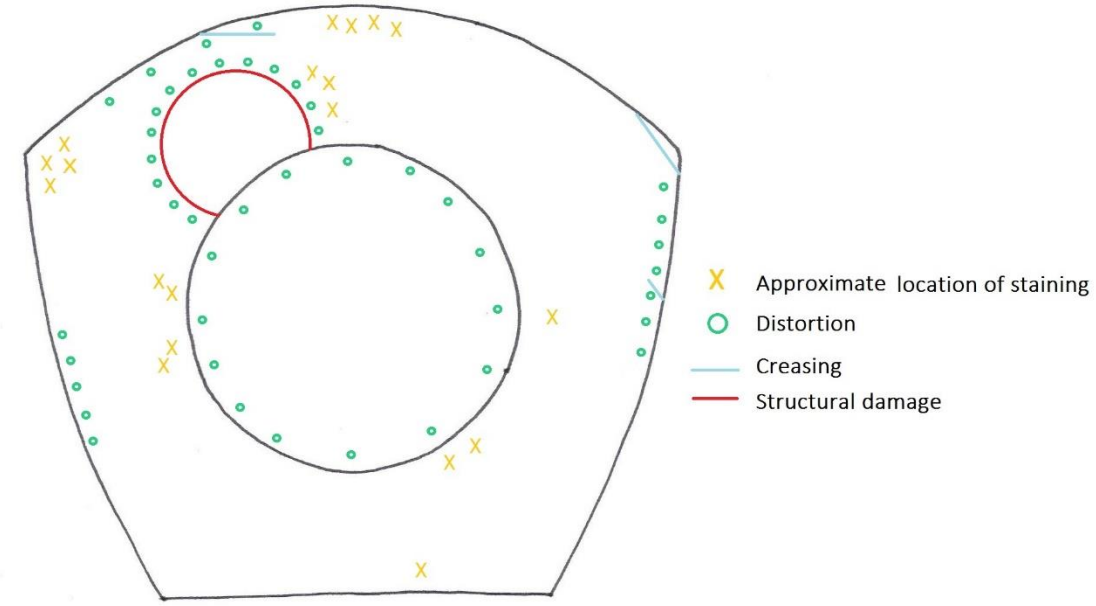


Fig. III.2.3 NMS Lace Collar B. Condition details.

Condition Details

Discolouration: The lace collar is discoloured to a yellow tone evenly throughout. This discolouration is typical of cellulose degradation, a sign of acidity in the fibres, which is also a contributing factor to its overall mechanical strength and slight rigidity.[97]

Soiling: There is little particulate soiling. Some foreign fibres are loosely bound within the net structure.

Staining: There are few areas of unidentified orange staining. It is possible that these areas are also a result cellulose

[97] Tímár-Balázsy, *Chemical Principles of Textile Conservation,* 36.

degradation at a more developed stage. Such staining is found randomly throughout the collar (Fig III.2.3).

Distortion: The lace collar is distorted around the area of structural damage, possibly due to the stretching or pulling of the lace prior to its breaking point. Distortion is also found around the outer circumference edges and delicate picot edging around the inner circumference, possibly due to wear, putting on, and removing the collar from over the wearers head, and or museum storage (Fig. III.2.3).

Creasing: One corner of the lace has become folded forming a small and insignificant crease. Some minor creases have developed around areas of distortion (Fig. III.2.3).

Structural damage: One large hole can be found to the back of the collar along the curved edge. This hole appears to have occurred from sever mechanical force. The fracturing of threads has resulted in the unravelling of the surrounding areas, and is at risk of further damage (Fig. III.2.3).

Weakness: N/A

Previous Repairs: N/A

Appendix IV A Brief Explanation of the Chemical Composition of PVA

PVA is a water-soluble synthetic polymer produced by the hydrolysis of poly (vinyl acetate). PVA can be categorised as either fully or partially hydrolysed. This depends of the amount of acetate groups that remain in the backbone.[98] Hassan states that, "The degree of hydrolysis, or the content of acetate groups in the polymer, has an overall effect on its chemical properties, solubility and crystallinity."[99] By fully solubilising the water-soluble materials, one aims to mitigate against any form of deterioration caused by volatile emissions, residual acidic or alkaline compounds and the effects of aged PVA.

[98] Chunxue Zhang, Xiaoyan Yuan, Lili Wu, Yue Han and Jing Shen, "Study of Morphology of Electrospun Poly (vinyl alcohol) Mats," *European Polymer Journal 41* (2005): 423.
[99] Christie M. Hassan and Nikolaos A. Peppas, "Structure and Applications of Poly (vinyl alcohol) Hydrogels Produced by Conventional Crosslinking or by Freezing/Thawing Methods," *Advances in Polymer Science Vol. 153* (Berlin-Heidelberg: Springer-Verlag, 2000), 38.

Appendix V A Brief Explanation of FTIR

FTIR is a quick and non-destructive analytical tool that does not require destructive sampling. It works by measuring the changes in energy absorbed by the material through an internal infrared (IR) beam that passes through an embedded crystal. The method requires excellent surface contact between the crystal and the sample as the IR beam only receives information from a depth of 2µm. The sample absorbs energy to create an attenuated evanescent wave. This data is translated into a digital spectrum. The spectra collected acts as a footprint for the material illustrating the IR absorbance or transmittance which correlates to the materials chemical composition.

Appendix VI A Brief Explanation of Oddy Testing

The Oddy test was pioneered by conservation scientist, William Andrew Oddy, at the British Museum in 1973, however it has since been modified by other contemporary conservation scientists. It is designed to artificially age a new material sample by placing it in a closed container with copper lead and silver metal foil coupons for twenty-eight days at 60˚C at 100% humidity. After the duration of the test, the presence of volatile emissions is qualitatively evaluated based on the level of corrosion products formed on the metal coupons. The subjective evaluation looks to determine whether the material is safe to use, and for how long.[100]

[100] Bamberger et al., *Studies in Conservation* 44, 87.

Appendix VII Oddy Test Procedure

Equipment:

Nitrile gloves, safety goggles and lab coat.

2g of test material per test.

50ml flat-bottomed glass tubes. One per test material, and one control per variable or round of testing.

New silicone stoppers. One per glass tube.

Scalpel.

1ml capacity glass vials. One per glass tube.

Cotton wool.

10% nitric acid solution.

Deionised water.

Sodium hydroxide pellets.

Large beakers and glass covers.

Copper foil (analytical quality) 10x30mm per test incl. control.

Lead foil (analytical quality) 10x30mm per test incl. control.

Silver foil (analytical quality) 4x25mm per test incl. control.

Scissors.

Glass brush for each metal.

Acetone.

Petri dish x3.

Watch glass x3.

Tweezers.

Method:

1. Prepare 10% nitric acid solution using deionised water. Note that Nitric acid comes as 65% concentrate, therefore additional mathematics is not necessary to reach the 10% solution.
   Soak all glass tubes, silicone stoppers and glass vials over-night.
   Rinse in deionised water and dry at 60˚C before use.

   Neutralise nitric acid solution and deionised water rinse with sodium hydroxide pellets until solutions reach pH7 for safe disposal.

2. Fill glass vials with deionised water, and seal using cotton wool. Stand upright in a beaker.

3. Cut samples of each foil.

   Clean tweezers in acetone.

   In the fume hood, use assigned glass brush per metal to abrade both sides and edges until the metal is bright and shiny. It is critical to clean the tweezers, wear new nitrile gloves and prepare a fresh work surface for each metal to avoid cross-contamination.

   Half-fill a petri dish per metal with acetone. Using a clean tweezers, place the abraded metal coupons in assigned petri dishes and cover with a watch glass. Leave for several minutes and dry on new blotting paper.

4. Label all glass tubes clearly. Record this information including any abbreviations in a notebook. E.g. V1M2 = Variable 1, Material 1.

5. Place 2g of each test material in assigned glass tube. Ensure it is pushed to the bottom of the tube.

6. Lower water-filled vile into each glass tube.

7. Clean new scalpel blade with acetone. Score the underside of each silicone stopper in three parallel lines, 4-5mm deep.

   Using clean tweezers per metal, insert the lead foil coupon into the centre scored groove, and the copper and silver foils coupons into the outer scored grooves. Take extra care to ensure metals do not touch (Fig. VII.1).

8. Place a silicone stopper (featuring metal coupons) on each glass tube, ensuring the metals do not come into contact with the test material before pushing down and creating an air-tight seal (Fig.VII.2).

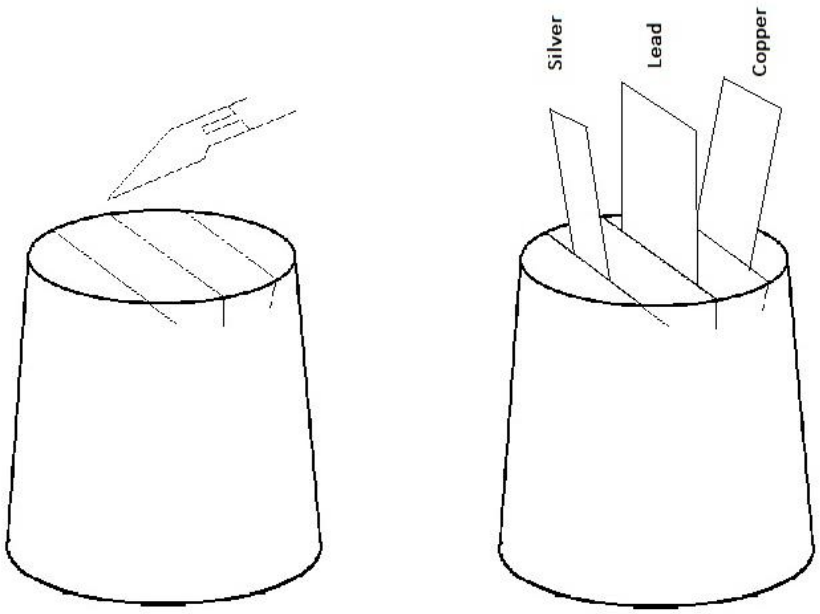


Fig. VII.1 Preparation of silicone stopper and placement of metal coupons.

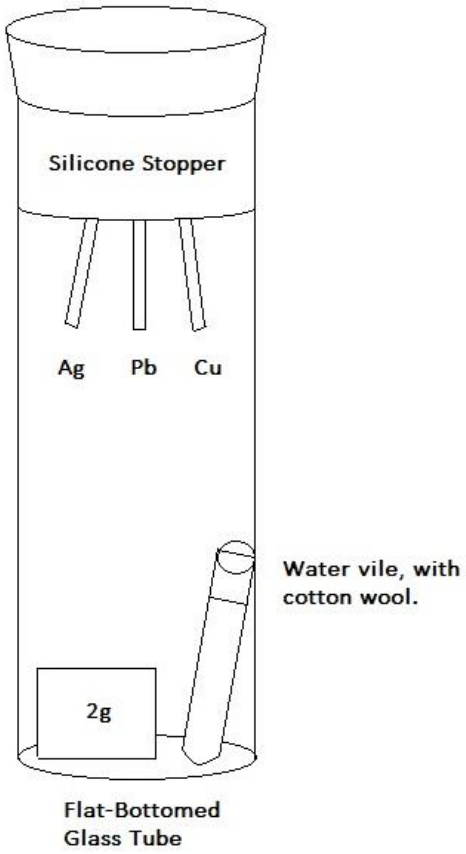


Fig. VII.2 Oddy test composition.

9. Make sure to include a blank test, one without test material as a control following the procedure above. The control is used to check that the metal coupons do not produce volatile emissions independently.

10. Place all tests including the control into a carrier and into a thermostatically-controlled oven at 60˚C for 28 days. Make note of start and end dates of tests. Tests should be checked and observed at 2-3 intervals during the 28-day period and note changes.

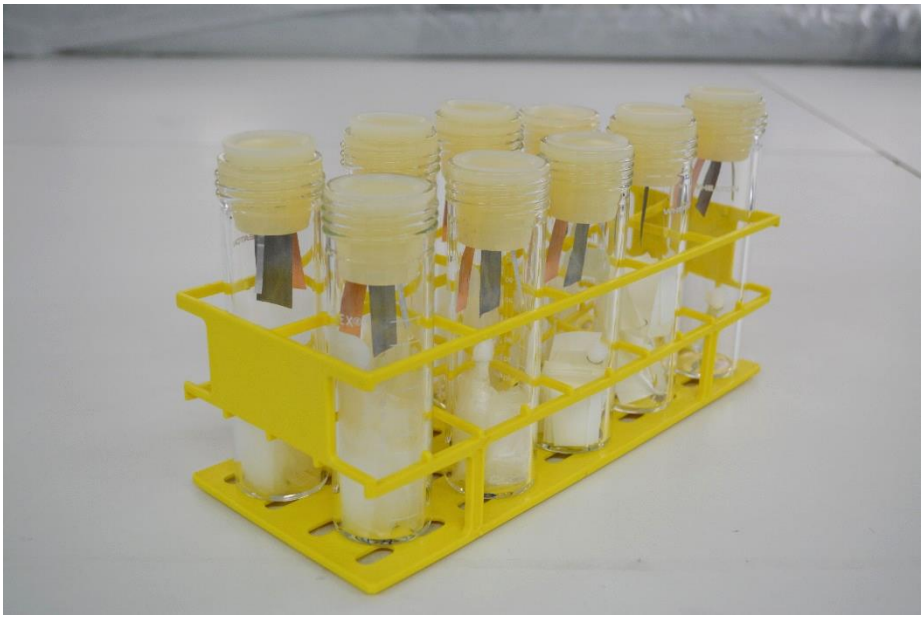


Fig. VII.3 Oddy tests sealed and in carrier ready to be placed in controlled oven.

Upon evaluation of the tests after the 28-day period of accelerated aging, if the metal coupons in the control test have remained bright and shiny, any changes to the rest of the tests are considered valid. However, if the metal coupons in the control test have changed significantly and appear dull and corroded, the rest of the tests are considered invalid, and the tests will need to be repeated with all new materials and clean equipment.

Appendix VIII A Brief Explanation of Measuring pH-Value

Acidity and alkalinity are measured in pH units on a scale of 1-14. pH1 being highly acidic, pH14 being highly alkaline, and pH7 being neutral. Each unit describes the concentration of hydrogen ions measured9mol/ in mol/l. For example, pH4 is an abbreviation of its concentration 0.0004%, or 10^{-4} (mol/l). The difference between each unit is ten times more or less concentrated. In other words, pH5 is ten times greater than pH4, and one hundred times greater than pH3.[101] Acidic or alkaline materials can promote deterioration of lace made from organic materials such as cotton, silk and linen. Mitigating against this, the ideal pH for the guipure ground infill should be as close to neutral at pH7 as possible.

There are two main ways of measuring the pH-value: Universal Indicator paper is a more refined version of litmus paper. The colour strip on the paper changes colour depending on the hydrogen content of a solution. The colours are compared against a chart that estimates the pH measurement. A pH Meter is a scientific instrument also used to measure the hydrogen content of a solution. The pH meter is composed of a digital battery powered monitor and an electrode. The electrode features a special membrane which isolates the hydrogen ions. These are measured through the electric current, and received by the digital monitor to produce a pH-value.[102]

There are advantages and disadvantages to each type. Universal indicator paper is widely available to buy, it is relatively cheap, quick to use, and disposable. It requires no preparation or maintenance. It does however have a shelf life which can affect the accuracy of readings. While a pH meter is generally very precise in its readings, the precision is reliant on proper care and maintenance, including accurate and regular calibration using non-contaminated buffer solutions.[103] It is more expensive, and the process of taking a pH reading is more time consuming than using universal indicator

[101] Moncrieff, *Science for Conservators,* 90-91
[102] Moncrieff, *Science for Conservators,* 100.
[103] Meredith Montague, "pH Testing Methods in Textile Conservation" in *The Textile Speciality Group Postprints, American Institute for Conservation, 23rd Annual Meeting, St. Paul, Minnesota. June 1995 Vol. 5.* (2005): 20-22

paper. With this in mind, the pH meter is significantly more sensitive than universal indicator paper, therefore providing a more accurate pH-value.

Appendix IX Instructions for Calibrating HI9024C Hanna pH Meter

Equipment: pH meter

pH electrode (stored in an electrolyte solution)

Calibration solutions: pH 7, pH 4 and pH 10

Deionised water

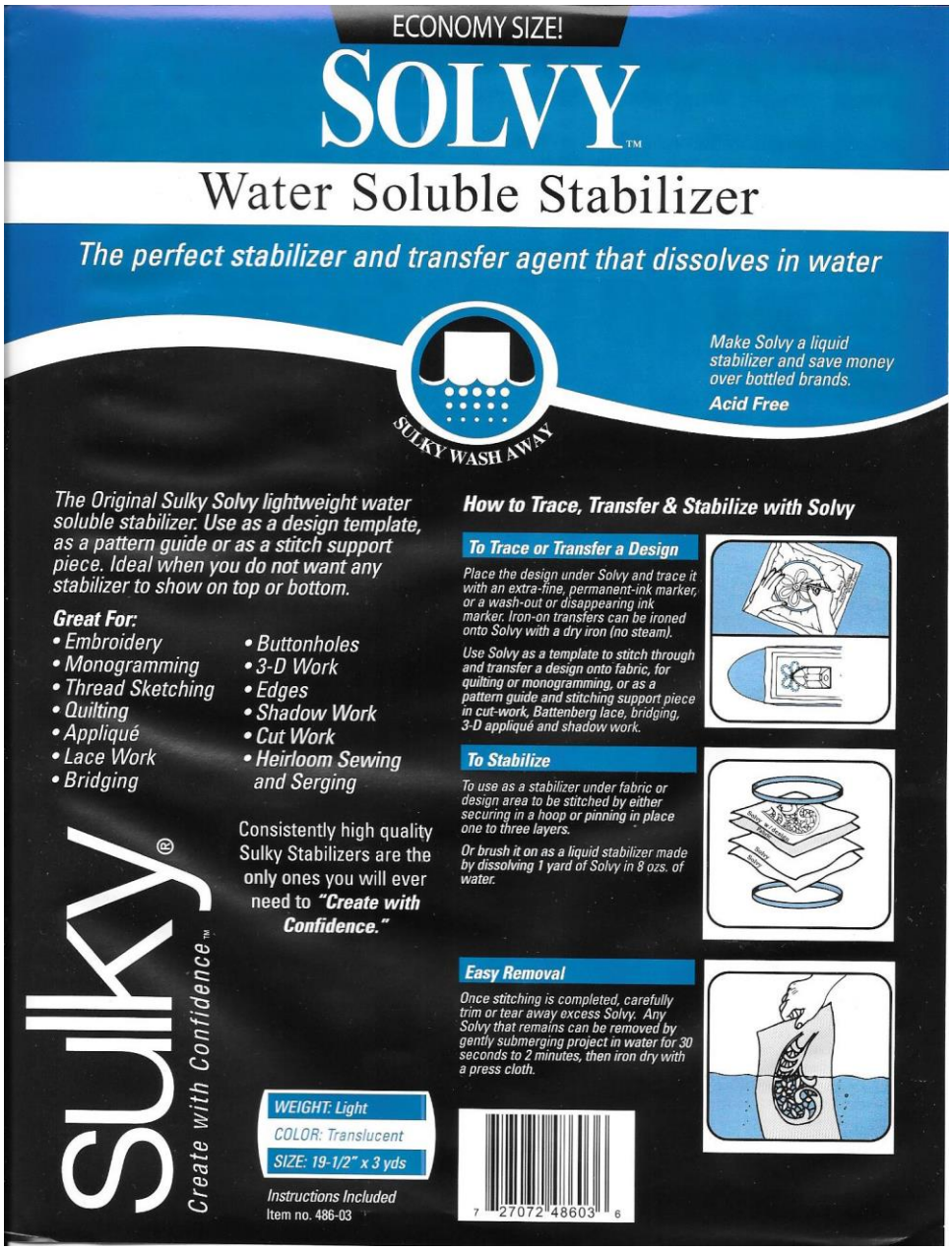
Beakers

Method:

1. Attach the pH electrode to the meter
2. Pour some pH 7 calibration solution into two beakers. Mark one as 'wash' and the other as 'measure.'
3. Remove the electrode from its storage solution bottle.
4. Rinse the electrode in the pH 7 'wash' solution.
5. Place the electrode into pH 7 'measure' solution. Gently stir until value is stable.
6. Press the **Cal** button on the meter.
7. Use the up and down arrow buttons to change the pH value on the bottom of the screen to **pH 7**.
8. The screen will flash '**not ready**' initially but should then stabilise to '**ready**'. Press the **Con** button.
9. Repeat steps 2-8 with either the pH 4 **or** pH 10 calibration solution. The meter will only accept two calibration values.
10. The meter is ready to use after the second calibration solution is used.

Appendix X Materials and Suppliers

Material 1:	Sulky® Solvy. 100% PVA Water-Soluble Film	
Brand:	Sulky®	
Purchased from:	Amazon	www.amazon..co.uk
Quantity:	1 Piece	50cm x 2.75m
Price (incl. VAT):	£8.11	



Sulky® Solvy™

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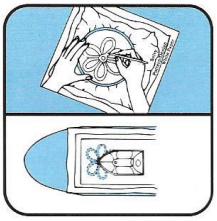
Consistently high quality Sulky Stabilizers are the only ones you will ever need to ***"Create with Confidence."***

How to use Solvy for Tracing, Transferring & Stabilizing.

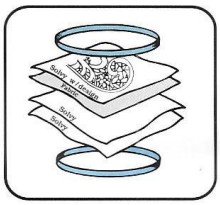
1. To Trace or Transfer...

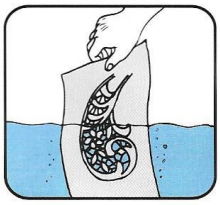
a design onto Solvy, place the design under Solvy (secured in a hoop for handling ease) and trace it with a soft-tip, extra-fine, permanent ink marker, or a washout or disappearing ink marker depending on the color of the thread and fabric to be used. Iron-on transfers can be ironed onto Solvy with a dry iron and no steam. Use as a design template to stitch through to transfer a design onto fabric as in Monogramming, Quilting, Thread Sketching and Lace Making, or as a pattern guide and stitching support piece as in Cut-Work, Battenburg Lace, Bridging, 3-D Thread Applique, Computer Lace and Shadow Work Applique.



2. Use as a Stabilizer...

under fabric or design area to be stitched by either securing in a hoop or pinning. Or by ironing 2-3 layers together with a press cloth and dry iron. Or brush it on as a liquid stabilizer made by dissolving 1 yd. in 8 oz. of water.





3. Removal is Easy...

once stitching is completed, carefully trim or tear away excess Solvy. Any Solvy that remains can be removed by gently submerging the project in water for 30 seconds to 2 minutes, then iron dry using a press cloth. Or remove Solvy by ironing between two damp paper towels or press cloths.

- Solvy is Non-Toxic • Store liquid Solvy in a sealed, labeled jar in the refrigerator for later use.
- Store unused Solvy in a sealed plastic bag.
- Solvy is a registered Trademark licensed to Sulky of America, Inc.

Use Solvy to make Exquisite Lace

Do open-pattern decorative stitching on delicate, open fabrics like tulle, netting and even nylon hose.

- Sandwich your open, delicate fabric between 2 layers of Solvy that are slightly larger than the fabric.
- Place the "sandwich" on the ironing board.
- Preheat dry iron between wool and cotton setting.
- If you don't have a teflon coating on the bottom of your iron, cover the "sandwich" with a dry press cloth or teflon pressing sheet.
- Press with a hot iron for several seconds to fuse layers together.
- Do whatever decorative stitching you desire on this very stable, fused combination.
- Use Sulky's Rayon, Metallic or Holoshimmer™ Thread for a more dramatic look.
- When stitching is completed, immerse the fused combination in water for a minute or two, rinse gently until Solvy is removed.

Use Solvy to turn Appliques

for the look of "Hand" Applique

- Trace or transfer a design onto a piece of Solvy that is larger than the design. Use Solvy as a backing piece, laying it on the right side of the fabric.
- Straight stitch (22 stitches to an inch) along drawn line for the entire desired shape.
- Trim up to a 1/2" seam allowance. Clip curves and points. Cut a slit in the center of the Solvy and turn. Press. Your applique is ready to be stitched to the base fabric.

Use Solvy for Monogramming

Solvy keeps stitches from being lost in knits like T-shirts and Sweatshirts and controls loops in nap fabrics like towels.

- Set up the machine for free-motion (Can also be used in Computer Embroidery)
- Create your letter grouping on graph paper, spacing letters by using the graph squares.
- Trace the letter grouping onto Solvy with a washout marker. (Secure in hoop for easy tracing.)
- Secure Fabric to be monogrammed in free-motion embroidery hoop.
  - Bottom Layer - 2-3 layers of Solvy
  - Middle Layer - Fabric to be Monogrammed
  - Top Layer - Solvy with letter(s) traced.
- Monogram using a close satin-like stitch.
- Remove the Solvy.

Refer to Sulky's Book 900B-11 - "Sulky Secrets to Successful Stabilizing" for more project ideas.

Solvy is also available in a -

1 yd. Package - Item # 486-01; 8" Roll - Item # 486-08; 12" Roll - Item # 486-12; 25 yd. Bolt - Item # 486-25.

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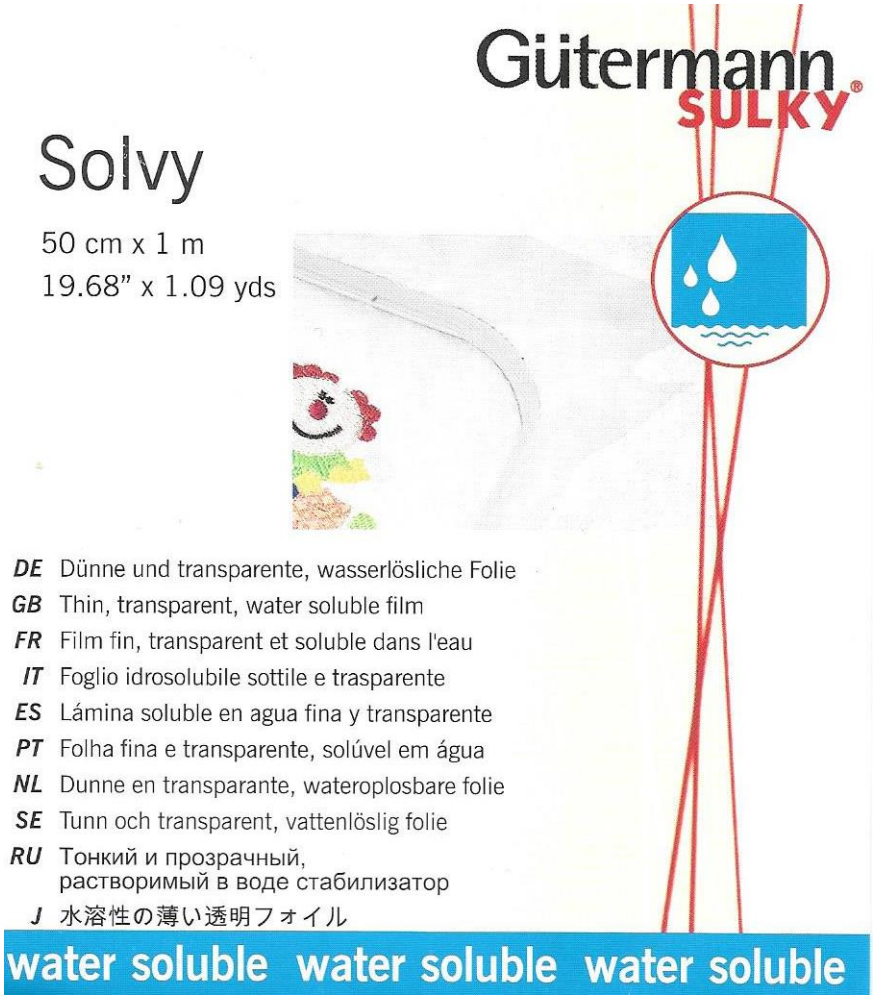
Material 2:	Gütermann Sulky® Solvy. 100% PVA Water-Soluble Film	
Brand:	Gütermann	
Traded under:	Gunold®	
Purchased from:	Sew Essential	www.sewessential.co.uk
Quantity:	1 Piece.	50cm x 1m
Price (incl. VAT):	£4.30	



GB **Machine embroidery:**
Solvy prevents embroidery stitches sinking into fleecy materials (e.g. towelling, fleece, cord). It serves solely as an overlay material and cannot replace an appropriate embroidery webbing, which acts as a stabiliser (embroidery underlay).

1. Mount the material (with embroidery webbing as underlay and Solvy applied as overlay) in the embroidery frame.
2. Embroider the desired design.
3. After the embroidery is complete, carefully tear or wash away excess Solvy.
   If you are working with towelling and wish to avoid embroidery webbing residues on the reverse, place several layers of Solvy under the towel.

Sewing extremely fine, light materials:

1. Place material between two layers of Solvy and sew as normal.
2. When complete, carefully tear away excess Solvy.
3. Remove remnants of Solvy with a damp cotton bud or wash.

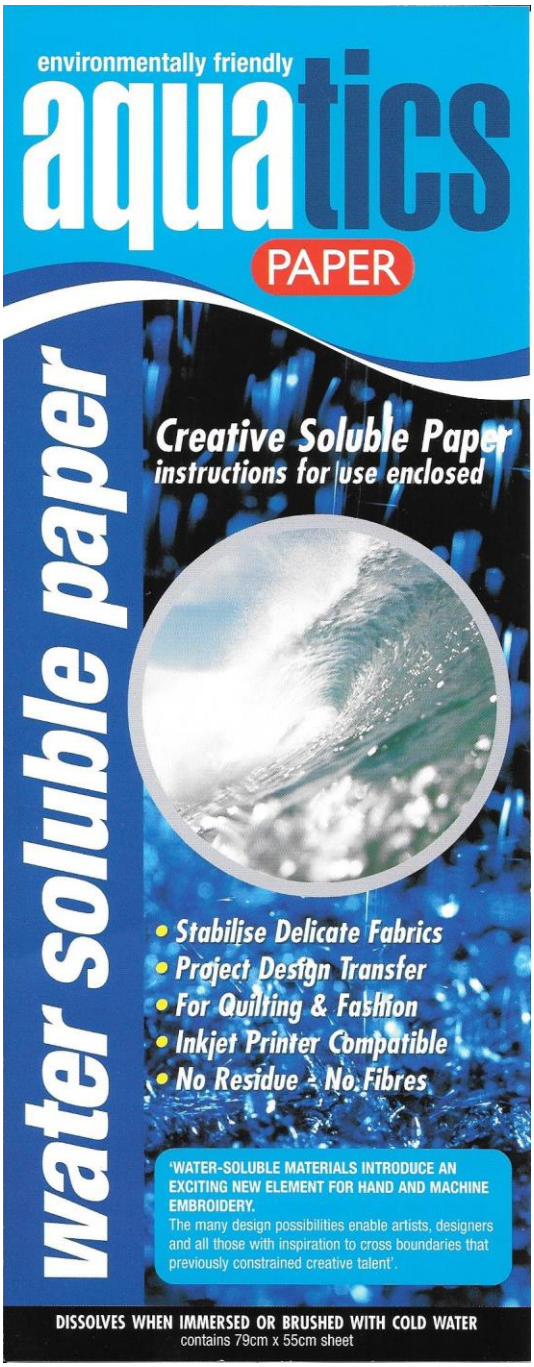
Creating buttonholes in fine, light fabrics:
Buttonholes can be sewn into very fine, light fabrics without inserts.

1. Place fabric between two layers of Solvy and sew buttonhole as normal.
2. When complete, carefully tear away excess Solvy.
3. Remove remnants of Solvy with a damp cotton bud or wash.

Embroidery and quilting:

1. Draw pattern onto Solvy using a water soluble pen.
2. Pin or tack film to the fabric or quilt.
3. Sew or quilt pattern as normal either by machine or hand.
4. When complete, carefully tear away excess Solvy.
5. Remove remnants of Solvy with a damp cotton bud.
   Protect against damp and drying out. Store in a sealed plastic bag.

Material 3:	Aquatics Paper. 90% Cellulose/10% PVA Water-Soluble Paper.	
Brand:	Aquatics	
Distributer:	Barnyarns Ltd.	
Purchased from:	Amazon	www.amazon.co.uk
Quantity:	One sheet.	79cm x 55cm
Price (Incl. VAT):	£5.97	



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FASHION DESIGNERS, QUILTERS AND CREATIVE EMBROIDERERS CAN BENEFIT FROM USING WATER SOLUBLE 'PAPER'. IT CAN BE USED AS A STABILISER AS WELL AS FOR PROJECT DESIGN TRANSFER.

IT IS STRONG ENOUGH TO REINFORCE DELICATE FABRICS WITHOUT ADDING BULK OR CHANGING THE CHARACTERISTICS OF THE FABRIC AND WILL ACCEPT BOTH COMPUTER GENERATED IMAGES PRINTED THROUGH AN INK JET PRINTER AND FREEHAND DESIGN DIRECTLY ONTO IT.

Original fashion and quilt designs can be embroidered through the paper directly onto the fabric. By following the original lines and colours, accurate representations can be created using either hand or machine embroidery. Once the design is sewn, the paper is dissolved completely away, leaving behind no chemically based residue.

When embroidering delicate fabrics like netting and silk, it is so important that a backing fabric be used, not just to stabilise the fabric but also to ensure smooth movement of the frame across the base plate of the machine. Conventional stabilisers leave unsightly fibres when removed but paper will leave no residue and no fibres and the design can also be printed directly onto the stabiliser.

Paper is sufficiently strong and stable to use either with or without a hoop. We do however recommend that when performing freestyle machine embroidery the feed dogs are off and a darning foot is used.

WASHING OUT

- To dissolve away the water-soluble paper completely, tear away any excess and hold under a slow running cold tap or agitate when immersed in cool water. Alternatively, as the paper dissolves effortlessly away, tear away the excess and remove any left over pieces with a damp soft brush. Paper is safe, harmless and environmentally friendly.
- Please remember that damp embroidered pieces should be dried as quickly as possible and must never be left folded or pressed together. When the soluble material has been washed away, place in a safe warm place to hasten the drying process.
- Dissolve time may vary, according to the amount of soluble material used and the density of the embroidery.
- Paper is also available by the metre for larger users.

We recommend experimentation on a small piece of fabric to ensure the material is suitable for your application

ARTICLE No. AQ4

Barnyarns

The Aquatics Range is distributed in the United Kingdom by
Barnyarns (Ripon) Ltd. North Yorkshire HG4 1AQ
Telephone. 01765 690069 email. shop@barnyarns.co.uk

Material 4:	Gütermann Sulky®. 90% Cellulose/10% PVA Water-Soluble Paper	
Brand:	Gütermann	
Traded under:	Gunold®	
Purchased from:	Sew Essential	www.sewessential.co.uk
Quantity:	12 Sheets.	21.6cm x 28cm each.
Price:	£10.26	

GB **Instructions:**

Paper Solvy dissolves in water in approx. 10 seconds. Used to transfer sample patterns via drawing, copying, tracing or printing. If the patterns are larger than a sheet of Paper Solvy, several sheets can be stuck together using KK 2000 (a temporary spray adhesive), or similar product.

Paper Solvy turns a light shade of brown when ironed. This discolouring has no effect on the paper's solubility. If the pattern is printed on Paper Solvy using an ink jet printer, care should be taken that water-proof ink is used. We recommend carrying out a test printing session beforehand, sewing and washing the results.

Sewing by numbers:

1. Transfer pattern onto Paper Solvy and cut out the desired block size in addition to seam allowance.
2. Sew on material sections on to the back of the Paper Solvy in numerical order (stitch length 1.5 – 2).
3. After the sewing stage is complete, dissolve Paper Solvy in water.

Crazy for fancy stitch:

1. Transfer pattern onto Paper Solvy and cut out the desired block size in addition to seam allowance.
2. Sew on material remnants, ribbons etc., until the block is fully covered.
3. Decorate the seams with random fancy stitching (using the sewing machine or by hand), beads, etc.
4. After the sewing stage is complete, dissolve Paper Solvy in water.

Material:	100% NYLON Net (20 Denier Monofilament, Scoured and Heat Set)
Supplier:	Dukeries Textile & Fancy Goods Ltd.
Material:	100% Silk Tulle
Supplier:	Dukeries Textile & Fancy Goods Ltd.
Material:	100% Cotton Bobbinet
Supplier:	Dukeries Textile & Fancy Goods Ltd.
Material:	Silk Crepeline
Supplier:	Le Lievre (UK) Ltd.
Price:	£19.50 per meter.
Material:	100% Egyptian Cotton Bobbin Lace Thread – 170/2
Supplier:	Clare's Laces http://www.claireslace.co.uk/shop/index.php
Price:	£7.50 per spool
Material:	Transparent blue adhesive film.
Supplier:	Mainly Lace www.mainlylace.co.uk
Price:	£3.50 per meter.
Material:	PVA adhesive
Supplier:	Colourfull™

Appendix XI Health and Safety

XI.1 Risk Assessment

University of Glasgow	Risk Assessment Form			
School: Culture and Creative Arts	**Section:** Centre for Textile Conservation and Technical Art History	**Location:** Room number(s) 309A & 310	**Reference No:** R 71	**Related COSHH Form (if applicable):** C 70

Description of activity:

Practical activities/ experiments for dissertation research.

1. Analysing four soluble films using Fourier Transform Infrared Spectroscopy

Process:

a. Using FTIR equipment – Perkin Elmer Spectrum One FT-IR Spectrometer with universal ATR Sampling Accessory.

2. Oddy testing of four soluble films.

Process:

a. Cleaning test tubes using 10% solution of nitric acid in water (up to 100ml nitric acid diluted in 1litre of water, neutralised sodium hydroxide)
b. Preparation of lead, copper and silver coupons using a glass brush and acetone, approx. 20ml.
c. Handling of coupons for assessment following 28 days testing at 60˚C.

3. Testing solubility and pH of four soluble films

Process:

a. Heating water up to 60˚C
b. Calibrating the H19024C Hanna pH Meter using calibration solutions at pH 7, pH 4 and pH 10.
c. Using Colorimeter pH strips

4. Creating lace infills using a sewing machine. Model: Janome Memory Craft 4900

5. Creating lace infills using stainless steel pins.

6. Assessing film residue using UV light

7. Assessing film residue using microscopy.

8. Prepare 5% Klucel G™ in 100ml water to use on silk crepeline to prevent fraying edges.

Persons at risk: Staff and Students

Is operator training/supervision required? If yes, please specify:

General staff supervision.

Hazards/ Risks	Current controls	Are these adequate?	What action is required if not adequately controlled?
Spills	Spills should be mopped up immediately and disposed of correctly. See COSHH form for chemical spills.	N	Refer to COSHH
Using chemicals and metal foils	Employ good workroom practice, appropriate PPE (lab coat, gloves, goggles) must be worn. Extraction must be used for chemicals and abrading metal foils using fume hood or Nederman extraction. Caps must be placed on solvents when not in use. Dispose of chemical is designated waste. Use solvent carrier to transport any chemicals. Use only small quantities of solvents.	N	Refer to COSHH
Electrical Equipment.	Use according to manufacture recommendations. Ensure recent safety PAT test has been done. Check appliance visually before use.	Y	

	Ensure all equipment is turned off after use. Unplug after use.		
Slips, trips and falls.	Plan your route, ensure walkway is clear.	Y	
Broken glass	Glassware to be disposed of in designated area in Chem. Lab or Wet Lab. Employ good workroom practice, wear PPE as appropriate.	Y	
Hot surfaces/liquids	Glassware to be disposed of in designated area in Chem. Lab or Wet Lab. Employ good workroom practice, wear PPE as appropriate.	Y	
Sharps	Dispose of appropriately in designated container.	Y	
UV Light	Limit personal exposure by wearing UV glasses. Display sign to alert others of UV light.	Y	

Completed by (print name and position, and sign):	Date:
BEVAN O'DALY Bevan O'Daly	2/6/17
Approved by (print name and position, and sign):	**Date:**
KAREN THOMPSON, TUTOR, Karen Thompson	1.6.17

XI.2 COSHH Risk Assessment

University of Glasgow	COSHH Risk Assessment	Ref No: C 70

School/Service/Unit:	Unit Safety Coordinator/Supervisor:
Centre for Textile Conservation and Technical Art History	Karen Thompson

Describe the activity or work process. *(Inc. how long/ how often this is carried out and quantity substance used)*	Accelerated ageing testing (Oddy testing) of four water-soluble films. Process: 1. Cleaning test tubes using 10% solution of nitric acid in water. (65%Nitric Acid) (100ml NaOH into 900ml deionised water) x1 for silicone stoppers and glass vials. (170ml NaOH into 1.530 L deionised water) x2 for test tubes. 2. Preparation of lead, copper and silver coupons using a glass brush and acetone, approx. 20ml. 3. Handling of coupons for assessment following 28 days testing at 60˚C. Neutralise NaOH solution with sodium hydroxide pellets until NaPH solution reaches neutral for disposal.
Location of process being carried out?	309A & 310

Identify the persons at risk:	Employees	Students	Public
	X	X	

Name the substance(s) involved in the process *(Attach data sheets to this assessment)*	Nitric acid, Acetone, sodium hydroxide, Lead foil, Copper foil, Silver foil.

GHP Classification *(state the category of danger)*

		X	X	X

X		X	X

Hazard Type							
	X		X	X	X	X	
Gas	Vapour	Mist	Fume	Dust	Liquid	Solid	Other (State)

Route of Exposure				
X	X	X		
Inhalation	Skin & Eyes	Puncture	Ingestion	Other (State)

Workplace Exposure Limits (WELs) *please indicate n/a where not applicable*

Long-term exposure level (8hrTWA):	Short-term exposure level (15 mins):
Nitric acid – n/a Acetone – 500ppm Lead – 0.15mg/m^3 Silver – 0.1mg/m^3 Copper – 1mg/m^3	Nitric acid – 1ppm Acetone – 1500ppm Lead – 0.45mg/m^3 Silver – 0.3mg/m^3 Copper – 2mg/m^3

What are the risks to Health from the process /tasks? (*look at the H and P codes on the data sheet)*

Nitric acid causes severe skin burns and eye damage. It is corrosive to the respiratory tract.
Skin corrosion and eye damage – C1.
Acetone causes eye damage. Repeat exposure may cause drowsiness and cause cracking of the skin.
Eye damage – C2.
Specific target organ toxicity – C3
Lead foil is harmful is swallowed of inhaled.
Acute oral toxicity – C4.
Specific target organ toxicity – C2.
Acute inhalation toxicity – C4.
Reproductive toxicity – C1.

What Personal Protective Equipment is used ? *(state type and standard)*			
 X Dust mask	Dust mask	 Visor	
 X Respirator	Fume hood	 X Eye wear	Plastic goggles
 X Gloves	Nitrile gloves	 X Overalls	Labcoat
 X Footwear	Closed-toe shoes.	 Other	

Assessment of the process/task
(List the summary of controls already in place and identify any gaps) Chemicals will only be used in very small quantities. All tasks will be carried out under fume extraction. Appropriate PPE will be worn, see above. Nitric acid will be diluted in fume hood. Acid into water.

Now rate the overall rating with the controls you have listed		
☐	☐	X
High	Medium	Low

List the new controls that need to be in place to give adequate control *(consider the need for monitoring as well as changes to the task or substitution of chemicals used)*
N/A

Final check: Has the risk rating been reduced to as low as possible with the new controls?
yes [x] Note any monitoring that may be needed ……..
Emergency Plans and procedures (this will apply to carcinogens, mutagens or similar health risks)
Are plans in place to deal with spillages or emergencies? Yes [X] N/a [ ] Refer to any first aid emergency that should be noted in this assessment: Contact doctor or poison centre. Eye contact – Rinse immediately with water for at least 15 min. Skin contact – Wash off immediately with water for at least 15 min. Ingestion – Rinse mouth with water. Inhalation – Move into fresh air. . Has waste disposal been considered and established Yes [X] N/a [ ] Lead must be displosed of with hazardous waste. Nitric acid should be neutralised before disposal. Small quantities (less than 300ml) can be disposed of down the sink followed by a large quantity of water.

Assessed by: Date: 2/6/17 Review Date:

Approval by: Date 1/6/17

Revised 15.6.17

University of Glasgow | School of Culture & Creative Arts

Declaration of Originality Form

This form **must** be completed and signed and submitted with all assignments.

Please complete the information below (using BLOCK CAPITALS).

Student Number: 2167907O

Course Name: Phil. Textile Conservation

Assignment Number/Name: Dissertation – Exploring Supplementary Methods for the Conservation of Lace.

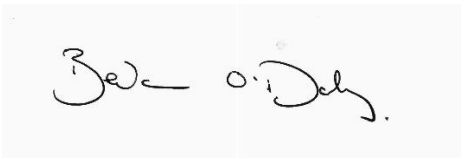
An extract from the University's Statement on Plagiarism is provided overleaf. Please read carefully THEN read and sign the declaration below.

I confirm that this assignment is my own work and that I have:

Read and understood the guidance on plagiarism in the Student Handbook, including the University of Glasgow Statement on Plagiarism	✔
Clearly referenced, in both the text and the bibliography or references, **all sources** used in the work	✔
Fully referenced (including page numbers) and used inverted commas for **all text quoted** from books, journals, web etc. (Please check with the Department which referencing style is to be used)	✔
Provided the sources for all tables, figures, data etc. that are not my own work	✔
Not made use of the work of any other student(s) past or present without acknowledgement. This includes any of my own work, that has been previously, or concurrently, submitted for assessment, either at this or any other educational institution, including school (see University Calendar 31.2)	✔
Not sought or used the services of any professional agencies to produce this work	✔
In addition, I understand that any false claim in respect of this work will result in disciplinary action in accordance with University regulations	✔

DECLARATION:

I am aware of and understand the University's policy on plagiarism and I certify that this assignment is my own work, except where indicated by referencing, and that I have followed the good academic practices noted above

Signed 

University of Glasgow | School of Culture & Creative Arts

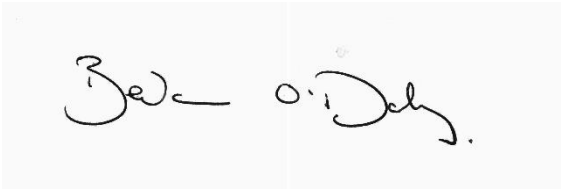
Taught Postgraduate Programmes
MPhil Textile Conservation

2016-2017

Student's Name: Bevan O'Daly

Dissertation Title: Exploring Supplementary Methods for the Conservation of Lace.

I agree to the above dissertation being held in the Centre for Textile Conservation and Technical Art History for reference purposes. I also agree to allow the University to supply an electronic copy of this dissertation to others, from one year after the date of submission, in so far as this will help disseminate the outcomes to the wider professional community.

Signature: 

Date: 18th August 2017

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