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A literature review of palm leaf manuscript conservation—Part 2: historic and current conservation treatments, boxing and storage, religious and ethical issues, recommendations for best practice

Abstract

The closure of the British Library during the 2020–2021 COVID-19 pandemic allowed the conservation department to undertake a treatment review of the conservation of palm leaf manuscripts in order to make better-informed decisions about the treatment of these complex objects. As part of the review a questionnaire was posted in 2020 to the Global Conservation Forum asking about the treatment of palm leaf manuscripts by others in the field. This two-part Literature Review uses the available literature and the survey results to address the wide range of issues inherent in the practical conservation of palm leaf materials. Part 1 began with an historic overview of palm leaf manuscripts and their production, leaf preparation methods, manuscript materials and media, palm leaf manuscripts at the British Library and the common types of damage found in such manuscripts. Part 2 details historic treatments and current conservation techniques as informed by our review and survey, as well as storage, religious and ethical issues. It concludes with two decision-making flowcharts, and our practical recommendations for conservators. The authors wish to share the collated information as widely as possible and help create greater continuity and consistency in palm leaf manuscript conservation by presenting recommendations for best practice for conservators who treat these amazing objects.

Keywords

palm leaf; boxing; long-term storage; conservation treatment; ethical conservation; traditional preservation methods

Introduction

The closure of the British Library (BL) during the 2020–2021 Covid-19 pandemic allowed the conservation department to undertake a treatment review on the conservation of palm leaf manuscripts to develop our knowledge of this subject in order to make better-informed decisions about the treatment of these complex objects. As part of the review a survey was posted to the Global Conservation Forum on the treatment of palm leaf manuscripts in August 2020. This two-part review uses available literature and the survey results to address the wide range of issues inherent in the practical conservation of palm leaf materials.

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Part 1 included a historic overview of palm leaf manuscripts and their production, leaf preparation methods, manuscript materials and various media, palm leaf manuscripts at the British Library and the common types of damage found in palm leaf manuscripts.¹ Part 2 will focus on historic treatments and current conservation techniques, boxing and storage, religious and ethical issues, and our recommendations for best practice.

The review consists of a written report, and four appendices which include the survey findings and a literature review in Part 1, as well as two decision-making flowcharts, and our recommendations for conservators in Part 2. Our goal is to share this information as widely as possible to help create greater continuity and consistency of treatments and improved practice among the relatively small numbers of conservators who treat these amazing objects.

Historic treatments and their implications for present treatments

The aim of the conservation and preservation of palm leaves is to improve the condition of the palm leaf to a point where it is safe to handle without fear of further damage and that the deterioration is halted. Conservation and preservation techniques must be deemed suitable and where possible reversible.

1 Cleaning methods

There have been many different techniques and substances used over the years for removing surface dirt and old oils from palm leaf manuscripts. These vary for many reasons, often down to regional and cultural differences as much as biochemical compatibility reasons. Some of these cleaning methods include: water (distilled, deionised, filtered or rain) or water with added non-ionic detergent or glycerine, or sodium salts of ortho-phenylphenate (known as OPP); ethyl alcohol (such as ethanol), isopropanol and magnesium bicarbonate; 111 trichloroethane; alcohol mixed with oil of camphor and probably other substances such as solvents that could have been the cause of dehydration of the leaves, stripping of natural elements vital to the leaves' longevity and being hazardous to the conservator using them.

Cleaning methods varied depending on the type of writing used on the palm leaf—whether it was surface written or incised, with which kind of ink, and whether there were illustrations or other types of decoration. Where possible water seems to be the preferred substance for removing surface dirt. However, it was often not possible to use water on leaves with the writing on the surface or those that have surface-painted illustrations or illuminations as water has a tendency to lift some inks and lacquers. Water, therefore, is more often used for cleaning incised palm leaf manuscripts with no illustrations or illuminations. Distilled water or other purified water such as cooled boiled water was used warm or cold on a cotton swab or cloth and carefully but firmly wiped over the palm leaf. It is important to note that water used on very deteriorated leaves can cause staining.

Palm leaves were frequently oiled in their preparation and this can cause an issue for cleaning with water alone and also presents a problem later at the repair stage preventing the adhesion of the adhesives. This is why other substances, such as detergent or glycerine, were often added to the water to neutralise the oil for more effective cleaning. Sodium salts of ortho-phenylphenate were also added as a mould inhibitor during cleaning. The prevalent choice which is still commonly used today is an ethyl alcohol like ethanol at a ratio of 1:1 with water, which does not leave any residue as the alcohol evaporates away.

Surface-written or painted palm leaf manuscripts were typically cleaned with an alcohol or solvent, such as 111-trichloroethane, a non-polar solvent

¹ Julia Wiland et al., 'A Literature Review of Palm Leaf Manuscript Conservation—Part 1: A Historic Overview, Leaf Preparation, Materials and Media, Palm Leaf Manuscripts at the British Library and the Common Types of Damage', *Journal of the Institute of Conservation* 45, no. 3 (2022): 236–59, <https://www.tandfonline.com/doi/full/10.1080/19455224.2022.2115093> (accessed 16 December 2022).

2 Om Prakash Agrawal, *Conservation of Manuscripts and Painting of South Asia* (London: Butterworth, 1984), 42; Jane L. Williams, ed., *The Conservation of Asian Lacquer: Case Studies at the Asian Art Museum of San Francisco* (San Francisco: The Asian Art Museum, 2008), 20.

3 Cf. for example, Agrawal, *Conservation of Manuscripts*, 43, 44; Anupam Sah, 'Palm Leaf Manuscripts of The World: Material, Technology and Conservation', *Studies in Conservation* 47 (2002), Issue sup.1: Reviews in Conservation 3: 21.

4 See, for example, David Jacobs, 'Workshop Notes of The Conservation and Stabilization of Palm Leaf Manuscripts', *South Asia Library Group, Newsletter* 40 (2010): 27–8; Susan Ghosh, Arnab Mahajan, and Swapna Banerjee, 'Palm Leaf Manuscript Conservation, The Process of Seasoning', *International Journal of Information Movement* 2, no. II (2017): 127.

5 Iwona Jurkiewicz, 'Magic in Conservation—Using Leaf-Casting on Paper and Palm Leaves', *Collection Care Blog, The British Library*, 2017, <https://blogs.bl.uk/collectioncare/2017/10/magic-in-conservation-using-leaf-casting-a-mechanical-pulp-repair-technique-on-paper-and-palm-leaves-as-the-library-i.html> (accessed 16 December 2022).

6 Ghosh, Mahajan, and Banerjee, 'Palm Leaf Manuscript Conservation', 127; Yeni Budi Rachman, 'Palm Leaf Manuscripts from Royal Surakarta, Indonesia: Deterioration Phenomena and Care Practices', *Restaurator—International Journal for The Preservation of Library*

applied with a cotton swab. Non-polar solvents were also used on lacquered palm leaves. This is because non-polar solvents are less inclined to dissolve or remove the lacquer.²

Removal of mould/fungus in the past was commonly achieved with thymol vapours. When used according to appropriate procedures in a fumigation chamber, thymol can effectively kill active mould, that is, mould growing on a damp surface. Alcohol, particularly ethanol on a swab, is also used for removing mould from palm leaf manuscripts and is probably a more common method used today.³

2 Repair of palm leaves

2a Palm leaf

Repairing palm leaf manuscripts using 'palm leaf' is a technique to infill losses which has been used in the past and here in the British Library; leaves would be cut to fit the loss by tracing the broken edge and then adhering them with EVA. The problem with this repair method is sourcing the correct type of palm leaf to match the manuscript being repaired. There are two main types of palm leaf that were used for manuscripts, the palmyra palm and the talipot palm, and each have different structural properties—one being more rigid and one more flexible respectively. Powdered palm leaf mixed with PVA has also been known to have been used for joining damaged leaves.⁴

2b Layered wood veneer

Wood veneer was used in the past by the British Museum to infill losses. Two layers of wood veneer, preferably birch, were used to simulate the thickness of the palm leaf. The wood was cut to shape by tracing the broken edge, similar to repairing with palm leaf and this was adhered with PVA glue.

2c Japanese papers, Sa (Thai mulberry paper)

This is the most versatile, successful, and widely used material for repairing palm leaf manuscripts as it can be layered to the thickness of the leaf for losses and large infills or its fibres can be mixed with an adhesive solution for small holes created by insects, applied with a dropper. Thin Japanese paper overlays can also be used for supporting cracks and tears and particularly useful papers for palm leaf repair include *kozo shi*, Maruishi and other mulberry papers. Repairing a vast number of palm leaf manuscripts using a leaf casting machine and toned paper pulp at the British Library had a great measure of success and produced visually pleasing results but has more recently been considered too invasive and messy.⁵

2d Other materials

Silk gauze and chiffon have also been in popular use in past times for stabilising tears, cracks and fissures in palm leaf manuscripts and have been adhered using variants of acrylic rubber, acrylic emulsion or wheat starch paste, among many others.

Traditional repair methods in those regions of Asia where palm leaves originate include the use of natural Southeast Asian lacquer used for consolidating the leaf edges and even a flame to singe frayed edges. Stitching was also used for joining broken pieces together.⁶

2e Adhesives

Many adhesives and adhesive combinations have been used in palm leaf manuscript conservation over the years and most are still used, some of which have been found to promote fungal growth, such as carboxy methyl cellulose, methyl cellulose, acrylic emulsion adhesives, acrylic

rubber, starch paste, cellulose acetate, diluted paraffin wax emulsion and polyvinyl acetate (PVA). Other adhesives used have been a (2%) solution of soluble nylon for consolidating a flaking leaf surface, and (30% w/v) sturgeon glue (isinglass) used as an adhesive for adhering repair materials.⁷

2f Humidification

Gentle slow humidification has been used for flattening warped or creased leaves. It could also aid the separation of leaves which have adhered together. Humidification was not used on lacquered leaves as it would cause the lacquer to lift.

2g Consolidation

Palm leaf manuscripts which have lacquer or surface paint will sometimes need consolidation if the media has degraded or lifted from the surface. Traditionally, Asian conservators would use *urushi* to re-adhere the lifting lacquer; however, as this is not reversible it is not popular with Western-trained conservators. Alternative consolidants used include pigmented wax, sturgeon glue (isinglass) or other animal glues.

3 Methods used for increasing flexibility

For many years a prevalent element of palm leaf conservation has been to preserve the flexibility of the manuscripts. To accomplish this oils have been applied to the surface of the leaves. These oils were the same as many of those used in the palm leaf preparation prior to inscription, such as citronella, camphor, lemon grass and dummala. Interestingly, these same oils also serve as insect-repellents. Another substance which has also been used to encourage flexibility is glycerine, which would be brushed onto the leaf surface with a soft brush. Often the flexibility gained does not last and so the process has to be repeated periodically. Another drawback which has been noted, is that it can attract dust and cause the leaves to adhere together, however, this may not be the case if kept in a controlled environment.⁸

The results from tests conducted in the early 1990s on various oils used on palm leaf manuscripts found that those from camphor, eucalyptus and clove can be helpful in their treatment. These oils are lighter and drier than other oils and are more readily absorbed through the epidermis into the tissue cells of the palm leaf, keeping the leaves soft and giving them the greatest flexibility. Interestingly, palm leaves in humid climates are comparatively supple whilst palm leaves in drier climates are more brittle.⁹

4 Repair of wooden boards

Traditionally made from hardwoods which often have natural insect resistant properties, one wood commonly used for the protective boards on palm leaf manuscripts is *Azadirachta Indica*, commonly known as *neem* or Indian lilac, part of the mahogany family.

In the twentieth century in Western institutions wooden boards were mainly repaired using acrylic emulsions such as polyvinyl acetate (PVA) or animal glues for splits or cracks such as at the British Museum. They were also sometimes repaired using wooden dowels and polyester resin. The dowels would be inserted into drilled holes and a polyester resin-based coloured paste built up and then sanded down. Boards were also at times completely replaced with acrylic resin or Perspex sheets, as shown in Fig. 8.¹⁰

Although any extant boards should always be kept for the information they contain, it's also worth considering replacing any that are missing or severely damaged for the continued protection of the manuscript,

and *Archival Materials* 39, no. 4 (2018): 242.

⁷ Agrawal, *Conservation of Manuscripts*, 47; Yana van Dyke, 'Sacred Leaves: The Conservation and Exhibition of Early Buddhist Manuscripts on Palm Leaves', *The Book and Paper Group Annual* 28 (2009): 90, <https://cool.culturalheritage.org/coolaic/sg/bpg/annual/v28/bpga28-17.pdf> (accessed 16 December 2022).

⁸ Jacobs, 'Workshop Notes', 26, 29.

⁹ See, for example, D.G. Suryawanshi, M.V. Nair, and P.M. Sinha, 'Improving the Flexibility of Palm Leaf', *Restaurator* 13, no. 1 (1992): 43.

¹⁰ Alfred Crowley, 'Repair and Conservation of Palm Leaf Manuscripts', *Restaurator* 1, no. 2 (1969): 110.

especially if it doesn't have a box. This kind of evaluation is true when carrying out any treatment on palm leaf manuscripts which introduces potentially modifying materials, with questions such as 'is it necessary?' and 'do the benefits outweigh the negatives?' always needing to be asked.

Traditional Asian conservation methods

It is important to consider some of the traditional conservation methods, as they are an integral part of the conservation history of palm leaf manuscripts from long before some of them entered Western collections.

Traditional Asian practices, focussing mostly on prevention and preservation, have been in use for centuries as there has been a long awareness of some of the deterioration mechanisms and factors that exacerbate them. To some extent some of these techniques remain in use especially for larger collections of manuscripts in more rural areas. In comparison to many contemporary Western methods they are considered as non-toxic to humans, and do not require specialist equipment, expertise or large expense.¹¹

Many of these methods were named incorrectly by Europeans during the colonial period and ignored and abandoned in favour of chemical-based approaches imported from the West. However, their long history of use and efficacy has resulted in an increasing amount of research being done, especially in South Asia, on the re-evaluation of these methods and the possibility of their use—with some modifications—in accordance with current conservation science.¹²

For a long time, biological growth and insect attack have been recognised as the most threatening causes of deterioration of palm leaf manuscripts in South Asia. Manuscripts were traditionally wrapped in yellow or red cotton or silk cloth to protect them from dust, direct environmental impact and insects. Both colours were used probably because the dye materials (most likely turmeric for the red colour) were believed to repel insects. They were usually stored in wooden chests or cupboards, together with dried leaves and spices, such as neem leaves, cloves and peppercorns known for their repellent qualities.¹³ Another popular storage area was in kitchen lofts, where the smoke was thought to keep termites and other insects away from precious manuscripts.¹⁴ The manuscripts were also periodically exposed to direct sunlight—believed to kill mould and insect growths—or taken out, cleaned and rehoused annually as a preventive measure.¹⁵

Several herbal or natural agents, usually very fragrant, would be put in storage together with the manuscripts, and their type varied greatly across India, Sri Lanka and other places in South Asia. Some of the most popular and effective agents included:

- (a) oil extracts (among others): lemongrass, citronella, black pepper, sandalwood, clove, neem, camphor, karanja, dummala or cinnamon, rubbed directly onto the leaves or used as smoke for fumigation, e.g. camphor oil;¹⁶
- (b) turmeric paste mixed, for example, with coconut leaf juice and wood charcoal rubbed onto the leaves¹⁷ or for dyeing binding cords and wrapping cloths;¹⁸
- (c) dried neem leaves placed between the manuscript covers;¹⁹ and
- (d) agents such as cinnamon and camphor or camphor and clove oil.²⁰

Many of these natural products have scientifically proven efficacy with active ingredients acting as antifungal agents, repellents, feeding inhibitors, egg-laying deterrents and direct toxins against a large number of insects.²¹

11 Jyotshna Sahoo and Basudev Mohanty, 'Indigenous Methods of Preserving Manuscripts: An Overview', *The Orissa Historical Research Journal* 47 (2004): 28–9, <https://iskconkl.wordpress.com/2007/01/13/indigenous-methods-of-preserving-manuscripts/> (accessed June 2020).

12 K.K. Gupta, 'An Introduction to the Traditional Practices for the Control of Biodeterioration of Manuscripts', in *Indigenous Methods and Manuscript Preservation, National Mission for Manuscripts* (New Delhi: Samraksika series; Vol. 1, 2006), 35–7; C.N.K. Alahakoon, 'Indigenous Conservation Practices for Palm-leaf Manuscripts in India', in *Indigenous Methods and Manuscript Preservation, National Mission for Manuscripts* (New Delhi: Samraksika series; Vol. 1, 2006), 62.

13 Gupta, 'An Introduction to Traditional Practices', 35–8.

14 Sahoo and Mohanty, 'Indigenous Methods of Preserving Manuscripts', 28–9.

15 Sahoo and Mohanty, 'Indigenous Methods of Preserving Manuscripts', 28–9.

16 Gupta, 'An Introduction to Traditional Practices', 38–9; Alahakoon, 'Indigenous Conservation Practices for Palm-leaf Manuscripts in India', 69–70.

17 Sahoo and Mohanty, 'Indigenous Methods of Preserving Manuscripts', 29–30.

18 Gupta, 'An Introduction to Traditional Practices', 38.

19 Gupta, 'An Introduction to Traditional Practices', 38.

Current conservation techniques

Current repair methods and approaches vary between Eastern and Western conservation traditions, cultures and regions, and are informed by the type of manuscript concerned. It is therefore important to consider the potential sacred status of a manuscript as it may have been an object of veneration, contain historic repairs or be the latest version within a culture of content transcription. Traditional Southeast Asian approaches tend to focus more on the preservation of information, with contemporary approaches still embracing relatively interventive treatments as well as an emphasis on pest prevention. In comparison, Western approaches continue to demonstrate a concern with minimal intervention.

1 Eastern approaches

A repair technique reported by Susan Gosh to be in use in India is to mix new palm leaf powder with PVA to form a 'gesso' to join damaged leaves.²² However, Ghosh also notes the spreading influence of Japanese conservation techniques. Anupam Sah suggests that in Southeast Asia there is a greater focus on digitisation rather than conservation,²³ perhaps due to limited resources. A discussion of Southeast Asian conservation methods indicates a preference for applying support through the use of materials such as silk gauze, chiffon or Japanese paper, adhered with PVA.²⁴ In the recent past, soluble nylon has been and may still be utilised for flaking, and infills undertaken with paper or palm leaf and methyl cellulose or PVA.²⁵ Naoko Takagi et al. describe the repair of rolled palm leaf manuscripts from Nepal using toned Japanese paper and methyl cellulose, an adhesive selected to suit the environmental conditions.²⁶ Their project aimed to apply minimal intervention in order to stabilise and prepare the manuscripts for digitisation,²⁷ using techniques and an ethical approach compatible with a Western approach, a consequence of the involvement of Japanese conservators in the project and the significant influence of Japanese methods and materials upon Western conservation.

2 Western approaches

In 2010 David Jacobs detailed the conservation approach of the British Library at the time. Prior to repair, leaf surfaces would be cleaned with water or ethanol and old repairs removed. New palm leaf or Japanese tissue was applied with EVA (ethylene vinyl acetate) or a mixture of EVA and methyl cellulose for the repair of splits, broken edges or losses. Cracks, vertical folds and creases were supported with Japanese tissue from the verso using a mixture of a small amount of EVA and methyl cellulose. For significant losses, the areas would either be infilled using new palm leaf and EVA, or Japanese papers (thicker papers or multiple layers of paper as necessary) adhered with a mixture of EVA and methyl cellulose.²⁸ A different technique was trialled at the British Library in 2017, with the use of leaf casting using toned paper pulp for palm leaves with severe losses, those with less damage were infilled with pulp by hand.²⁹

Julia Poirier suggests that the physical characteristics of palm leaves enable the adaptation of paper conservation techniques.³⁰ At the Chester Beatty museum in Dublin, frayed edges and broken areas on illustrated palm leaves were repaired using isinglass re-moistenable pre-coated Japanese tissue on the outer layers, and wheat starch paste for areas of delamination.³¹ Elsewhere, Yana van Dyke has written about a 'conservative conservation strategy' for the treatment of Indian manuscripts implemented at the Metropolitan Museum of Art in New York.³² Infills are not applied unless the areas of loss are at risk, for which Japanese paper is used with isinglass. Japanese paper and isinglass are also applied for repairs and stabilisation,³³ however, damage to edges and binding holes is generally preserved as evidence of use.

20 Gupta, 'An Introduction to Traditional Practices', 37–8.

21 Gupta, 'An Introduction to Traditional Practices', 37–8, 40–4.

22 Ghosh, Mahajan, and Banerjee, 'Palm Leaf Manuscript Conservation', 127.

23 Sah, 'Palm Leaf Manuscripts of The World', 19.

24 Sah, 'Palm Leaf Manuscripts of The World', 21.

25 Sah, 'Palm Leaf Manuscripts of The World', 21.

26 See, for example, Naoko Takagi, Yoriko Chudo, and Reiko Maeda, 'Conservation of Digitisation of Rolled Palm Leaf Manuscripts in Nepal', Paper Conservators Asia Unlimited, blog post November 2005, <https://www.asianart.com/articles/tamsuks/> (accessed September 2020).

27 Takagi, Chudo, and Maeda, 'Conservation and Digitisation of Rolled Palm Leaf Manuscripts'.

28 Jacobs, 'Workshop Notes', 27–8.

29 Jurkiewicz, 'Magic in Conservation', 2017.

30 Julia Poirier, 'Delaminating and Fraying Fibres: Developing an Advanced Treatment Approach for the Conservation of a 12th Century Palm Leaf Manuscript', Chester Beatty, Dublin Castle, March 2020, <https://chesterbeatty.ie/conservation/delaminating-and-fraying-fibres> (accessed June 2020).

31 Poirier, 'Delaminating and Fraying Fibres'.

32 van Dyke, 'Sacred Leaves', 88.

33 van Dyke, 'Sacred Leaves', 91.

34 Janay Laudat, 'South Asian Heritage Month Collection Close Up: Preserving Palm Leaf—A Sacred Manuscript Tradition', blog post, The John Rylands Library, Manchester, August 2020, <https://rylandscollections.com/2020/08/03/south-asian-heritage-month-collection-close-up-preserving-palm-leaf-a-sacred-manuscript-tradition> (accessed September 2020).

35 Melanie Nief, Wolfgang Baatz, and Sigrid Eyb-Green, 'Kammavacas: Lacquered and Gilt Palm Leaf Manuscripts from Burma. Analysis of Materials and Techniques in the Context of a Conservation Case Study', *The Journal of Paper Conservation* 11, no. 3. (2010): 25.

36 Nief, Baatz, and Eyb-Green, 'Kammavacas: Lacquered and Gilt Manuscripts', 25.

37 Kimberley Nichols, 'An Alternative Approach to Loss Compensation in Palm Leaf Manuscripts', *The Paper Conservator* 28, no. 1 (2004): 106.

38 Jacobs, 'Workshop Notes', 28.

39 Nichols, 'An Alternative Approach', 107–8.

40 Takagi, Chudo, and Maeda, 'Conservation and Digitisation of Rolled Palm Leaf Manuscripts'.

41 Crowley, 'Repair and Conservation of Palm Leaf Manuscripts', 107.

42 Agrawal, *Conservation of Manuscripts*, 41–2; Jacobs, 'Workshop Notes', 26; Sah, 'Palm Leaf Manuscripts of The World', 21.

43 Jacobs, 'Workshop Notes', 27; Takagi, Chudo, and Maeda, 'Conservation and Digitisation of Rolled Palm Leaf Manuscripts'; Rachman, 'Palm Leaf Manuscripts from Royal Surakarta', 238.

Janay Laudat, a paper conservator at the University of Manchester Libraries reflects a similar concern with intervention, stating 'as conservators, we intervene as minimally as possible to make manuscripts safe for handling, exhibition, digitisation and research access; while preserving their intangible value as sacred Buddhist objects'.³⁴ When conserving Burmese *Kammavaca* lacquered and gilded manuscripts, conservators from the Austrian National Library also devised an approach that foregrounded minimal intervention.³⁵ Loss compensation was not considered necessary for structural integrity and so was not applied as preservation was prioritised over aesthetics. Flaking lacquer was consolidated using isinglass, and cracks and frayed edges were stabilised with Japanese tissue and isinglass.³⁶

In a 2010 paper Kimberley Nichols, then at the Art Institute of Chicago, details another infill technique. Nichols explores the benefits of using *kozo* white bark and Japanese paper as an unconventional repair method. She explains that *kozo* has a high cellulose content, which matches the palm leaf structure, appearance and degradation properties but where palm leaf has a lignin content of 11%, *kozo* contains only 3%. Nichols describes how the *kozo* plant fibres are boiled and regularly washed during the paper-making process, which washes the lignin away and she suggests that '*kozo* white bark was a better-quality material than palm leaf and therefore acceptable as an infill material'.³⁷ In a case study Nichols describes the conservation of an Indian manuscript using toned white *kozo* bark to stabilise and infill large areas of loss. Layers of washed, dried and shaped *kozo* bark are used to infill lost material and a thin *mitsumata* Japanese paper is applied over the infill with wheat starch paste to fix it in place, similar to the method described by Jacobs using thick Japanese paper for infills.³⁸ As well as for infills, Nichols uses *mitsumata* for all other repairs, splits and tears with a 50:50 2% methylcellulose and thick wheat starch paste adhesive applied for strength and flexibility. This adhesive mix is translucent when dry and the *mitsumata* paper makes the infill opaque (so the bark's texture is no longer visible), and therefore complementary to the palm leaf surface. Nichols states that both new and more established methods used in palm leaf treatments should be explored and compared to help improve treatment standards in such a specialised area. As Nichols mentions, the variety of repair and infill methods examined in this literature review indicates a lack of consistency and standards in the approach to repairing and infilling palm leaf manuscripts.³⁹

3 Approaches to surface cleaning

After an initial soft brushing (or careful wiping with a clean cloth) of the palm leaves, distinction is drawn between the treatment of incised or surface-written leaves for more detailed surface cleaning, with Takagi et al. advising the complete avoidance of text areas.⁴⁰ Alfred Crowley also cautioned that water can lift ink from surface-written leaves.⁴¹ For incised leaves various authors have suggested using cotton swabs with water for surface-written leaves,⁴² ethanol swabs for illuminated leaves⁴³ or swabs of both (e.g. a 50/50 solution) for lacquered leaves.⁴⁴ Van Dyke refers to an approach to surface accretions from smoke, dirt or oil, where they are mainly left as evidence of use and veneration.⁴⁵ They are removed under magnification only if they obstruct the overall reading of the text, or are fragments from offset leaves that have stuck to the adjacent leaf or insect deposits. Laudat similarly states that 'we ... respect the signs of wear, dirt and staining from oil and candles as evidence of their historical use in religious ritual in South Asian temples, monasteries and homes'.⁴⁶ Regarding the removal of previous repairs using tape, only Jacobs and Takagi et al.⁴⁷ referred to the removal and cleaning of tape residues using acetone.

4 Mould removal

Anupam Sah discusses how mould can occur as greenish black colonies,⁴⁸ and how penetration studies of mould on Talipot leaves indicated that it is not just the surface but the whole leaf structure that can be affected. He suggests that mould can be best cleaned with ethanol swabs. Jana Igunma makes brief mention of the Thai tradition of cleaning dried mould with a 'soft piece of cotton or a brush made from soft animal hair on a bamboo stick'.⁴⁹

5 Humidification

Van Dyke argues that 'rehydration of the leaves is considered one of the most important first steps in addressing support problems', due to desiccation, embrittlement and distortions, and recommends the use of a 'Gore-Tex sandwich'.⁵⁰ Takagi et al. describe the use of a chamber using wet layers of Nepalese or *Loktar* paper to facilitate the unrolling of palm leaf rolls.⁵¹ A humidification chamber with blotter and Gore-Tex or Sympatex® would work equally well for slow, gentle humidification.

For the opening of folds and creases van Dyke suggests the application of a localised ultrasonic misting to the area concerned prior to any overall humidification.⁵² Likewise a nebuliser could be used to apply a very fine mist for careful humidification. Sah also advises slow humidification prior to the pressing of any creases.⁵³

6 Consolidation of media

Following testing, van Dyke found that the best consolidant for both palm leaf media and the palm leaf support is isinglass.⁵⁴ A warm solution of 1% isinglass is applied with a brush to the paint layer, under magnification, while for the consolidation and stabilisation of the support layers a stronger solution of 3–4% can be used. However, Sah suggests that from a South Eastern perspective there is the need to weigh the risks and benefits of introducing consolidants as opposed to applying fresh ink, with any decision informed by whether the aim is to only make the incised text visible, or to preserve the 'original' ink particles.⁵⁵

7 Lacquered palm leaves

In their discussion of Burmese palm leaf *Kammavacas* (Buddhist prayer books) which are completely lacquered and decorated with metal leaf,⁵⁶ Melanie Nief et al. describe how surface cleaning was very carefully carried out with swabs moistened by water and ethanol due to their lacquered surfaces. Although there are some similarities in appearance between Burmese lacquer and that from other Southeast Asian countries, it is of a different composition to the more widely known *urushi* from Japan, China and Korea. Consolidation of friable layers was done with a 5% solution of isinglass with ethanol added to reduce surface tension. Humidification was carried out using a Gore-Tex sandwich to carefully introduce moisture in a controlled manner and any frayed and cracked areas where lacquer was missing were secured with Japanese tissue and isinglass.⁵⁷

With lacquered manuscripts there is a danger of using too much moisture, as it can cause lacquer to lift and separate from the surface of the leaf. Likewise, some thicker types of lacquer on palm leaves may need more humidification, and some conservator colleagues have suggested the use of solvents, such as ethanol or methanol, as plasticisers to avoid using too much moisture.

8 Oiling

There is much reference in the sources to the use and benefits of different oils for the longevity of palm leaves. P. Perumal,⁵⁸ D.G. Suryawanshi,⁵⁹ and Susan Ghosh⁶⁰ have all variously indicated that re-oiling is an active

44 Nief, Baatz, and Eyb-Green, 'Kammavacas: Lacquered and Gilt Manuscripts', 26.

45 van Dyke, 'Sacred Leaves', 92.

46 Laudat, 'South Asian Heritage Month'.

47 Jacobs, 'Workshop Notes', 27; Takagi, Chudo, and Maeda, 'Conservation and Digitisation of Rolled Palm Leaf Manuscripts'.

48 Sah, 'Palm Leaf Manuscripts of The World', 21.

49 Jana Igunma, 'The Beauty of Palm Leaf Manuscripts (3): Storage and Preservation', 6 February 2015, <https://blogs.bl.uk/asian-and-african/2015/02/the-beauty-of-palm-leaf-manuscripts-3-storage-and-preservation.html> (accessed August 2020).

50 van Dyke, 'Sacred Leaves', 90.

51 Takagi, Chudo, and Maeda, 'Conservation and Digitisation of Rolled Palm Leaf Manuscripts'.

52 van Dyke, 'Sacred Leaves', 90.

53 Sah, 'Palm Leaf Manuscripts of The World', 22.

54 van Dyke, 'Sacred Leaves', 89.

55 Sah, 'Palm Leaf Manuscripts of The World', 21.

56 Nief, Baatz, and Eyb-Green, 'Kammavacas: Lacquered and Gilt Manuscripts', 19–20.

57 Nief, Baatz, and Eyb-Green, 'Kammavacas: Lacquered and Gilt Manuscripts', 25.

58 Dr P. Perumal, 'Conservation of Palm Leaf Manuscripts', Sarasvati

Mahal Library, Thanjavur, August 2018, presentation slides: <http://www.iip.res.in/archives/pdfs/Perumal.pdf> (accessed 8 January 2023).

59 Suryawanshi, Nair, and Sinha, 'Improving the Flexibility of Palm Leaf', 43.

60 Ghosh, Mahajan, and Banerjee, 'Palm Leaf Manuscript Conservation', 126.

61 Rachman, 'Palm Leaf Manuscripts from Royal Surakarta', 238.

62 Sah, 'Palm Leaf Manuscripts of The World', 20.

63 Jacobs, 'Workshop Notes', 29.

64 Rachman, 'Palm Leaf Manuscripts from Royal Surakarta', 240.

65 van Dyke, 'Sacred Leaves', 92.

method in India, with Ghosh adding that if the text is not legible then lamp soot is mixed with the oil. Yeni Budi Rachman describes an Indonesian practice of mixing oil with candlenut powder to bring out the colour of the text.⁶¹ Both authors mention different oils being utilised for different purposes, such as insecticides, to impart flexibility or for overall preservation. However, Sah argues that the flexibility imparted by oiling is temporary, that oils can attract dust, cause leaves to fuse together and result in structural damage.⁶²

From a Western perspective, Jacobs describes re-oiling (incised) manuscripts at the British Library, sometimes also applying lamp black with the oil to rejuvenate the text if the old oil had been previously removed for repairs.⁶³ However, due to the risks mentioned by Sah re-oiling is no longer carried out at the British Library, although scholars sometimes still ask for it. Instead, these manuscripts are digitised to minimise future handling.

9 Retention or replacement of the original binding cord

Little reference was found during the literature review regarding treatment of the cord. Only Rachman mentions its annual replacement as part of an Indonesian method.⁶⁴ As with wrappers and boards, cords are integral parts of the manuscript and should always be preserved and retained and should only be replaced if they are in very poor condition or badly torn. Ideally it should be replaced with similar material in a similar colour for aesthetic reasons. Unfortunately, this has not always happened in the past at the British Library (and other institutions). Some modern cords are made of black nylon, but traditionally cords were almost never black, as it's not appropriate for Buddhist scriptures and should be changed when possible by conservators or curators, according to British Library curator Jana Igunma.

Exhibition and display

It is often the case that folios from manuscripts are removed from their context for display, especially in museums where they might not have all the folios in their collections.⁶⁵ If there are only some leaves or fragments of a manuscript available for an exhibition, it is understandable that some institutions would want to mount and frame smaller numbers of leaves for display. However, one could argue that it's important to display these manuscripts in their original context and with their intended form intact by displaying whole manuscripts, or as many folios as possible strung in a bundle to give the effect of a whole manuscript, so that the object can be fully appreciated whenever feasible.

Boxing and storage

General care of palm leaf manuscripts was a major concern in the past and significant efforts were made to protect collections from the various agents of deterioration. These efforts combined both practical and religious safeguards and were applied in the preservation of various collections around the world, some of which are still continued.

1 Traditional boxing and storage

As mentioned above, palm leaf manuscripts were customarily kept between two wooden or sometimes metal boards tied together with a binding cord. These boards were an inherent part of the object, and the more important the manuscript, the more ornate the boards or wrapper would be. The boards were slightly bigger than the size of the individual leaves to protect the fragile edges from damage, while also serving to keep the leaves pressed in place.

As mentioned above, the traditional practice for the housing of palm leaves is to wrap the manuscript lightly in a square piece of cloth—

usually in yellow or red made of silk or cotton—with a cord attached to one corner. After being wrapped the manuscript is then secured or bound with the attached cord into a bundle, thus exerting an even pressure on the leaves and protecting the manuscript from dust, insects and variations in atmospheric humidity.⁶⁶

If cloth was used for the wrapper, it would occasionally be interwoven with bamboo strips to provide extra stability for manuscripts that had no wooden covers for protection (see Fig. 1). Sometimes a cotton or silk bag of the same size or longer than the manuscript was used instead of a piece of cloth to protect the palm leaves. The cloth wrappers were either tailor-made or simply an unused piece of fabric or piece of clothing, like a women's skirt or a hand-woven shawl made of silk. Sometimes manuscripts were stored without a wrapper and were secured with the binding cord alone.⁶⁷

As indicated above it was commonplace for palm leaves to be kept in or above kitchens in an attempt to preserve them from fungus and insects. The warmth and smoke from the kitchen were thought to restrict the absorption of moisture thereby controlling fungus growth while deterring insects. Otherwise, in royal palaces and government buildings manuscripts were stored in separate rooms with stone floors,⁶⁸ and in Buddhist temples, traditional repositories were often special buildings erected on high base walls either on stilts or pillars to keep manuscripts safe from possible flooding and insect attack.

The palm leaves themselves, especially if in temples, were traditionally stored in either cabinets, chests or boxes.⁶⁹ When required for a public display, read and discussed during Buddhist ceremonies or studied by individual monks, a special wooden stand or rack holding up to four manuscripts at a time was used. These racks were often decorated with intricate carvings, lacquer or gold leaf.

⁶⁶ Agrawal, *Conservation of Manuscripts*, 59.

⁶⁷ Jana Igunma, 'The Beauty of Palm Leaf Manuscripts (2): Northern Thai, Lao and Shan Traditions', 23 January 2015, <https://britishlibrary.typepad.co.uk/asian-and-african/2015/01/the-beauty-of-palm-leaf-manuscripts-2-northern-thai-lao-and-shan-traditions.html> (accessed June 2020).

⁶⁸ Igunma, 'The Beauty of Palm Leaf Manuscripts (3)'.

⁶⁹ Igunma, 'The Beauty of Palm Leaf Manuscripts (3)'.



Fig. 1 Original woven wrapper for British Library Thai palm leaf manuscript Or. 16790, cotton and bamboo mat with white lining, nineteenth century.



Fig. 2 Bespoke wooden case with *Kammavācā* palm leaf manuscript in Tham script, the decoration of the manuscript cover boards is repeated on the case. Lanna or Laos, British Library, Or. 16893, nineteenth century.

Single manuscript cases were specially made for valuable or important Buddhist works, such as manuscripts sponsored by members of the royal family or those produced for special occasions, like ordinations or funerals (Fig. 2). They were often decorated in the same techniques and designs as the manuscript boards and made from wood, and some with metal clasps. Cane boxes made like a woven basket were also produced to store individual manuscripts.⁷⁰

Storage chests with lids or cabinets with lockable doors were used for the majority of manuscripts without their own case (Figs 3 and 4). These were mostly found in Buddhist temple libraries or in royal palaces and were designed to house extensive collections. All these chests were made from wood and were beautifully carved or decorated and often have pedestal legs to elevate them and provide protection from flooding.

2 Contemporary boxing and storage

There is a range of practices for modern boxing and storage of palm leaf manuscripts, suggesting some inconsistency as with their conservation. Palm leaf manuscripts in museums and libraries should ideally be wrapped in their original wrapper or if not then in unbleached cotton cloth such as aerocotton or calico. If there is no box or chest to house them the manuscripts should be stored when possible in a 'drop-back' buckram covered box, which is much stronger and more protective than a 'phase box' made from a single piece of board. In addition, even when stored in buckram boxes, manuscripts should ideally not be stacked on top of each other while shelved, however this depends on available space (Fig. 5).

Traditional preservation methods in temples were not followed by those Western institutions that collected palm leaves and encapsulation was a common practice used to house them.

Glass, Perspex® acrylic sheeting (polymethyl methacrylate), cellulose acetate or Melinex® polyester film (polyethylene terephthalate) can be either sewn, edge or spot welded to secure or seal the manuscripts.

2a Storage in other institutions

As part of our survey and literature-based research, we compared storage methods at various institutions to get a fuller picture of how palm leaf manuscripts are stored in collections today. Some of this information came from articles we found that detailed the collections in a library or institution, and other details came from conversations with conservators and colleagues from other institutions. (Some of the details from articles may be slightly limited or now somewhat out of date, but we hope that most of the information is still accurate.)

⁷⁰ Igunma, 'The Beauty of Palm Leaf Manuscripts (3)'.



Fig. 3 Wooden manuscript chest decorated with red lacquer, raised gilt lacquer and carved and gilt wooden applications. Lanna or Shan region, British Library, Foster 1060, nineteenth century.

The Asa Archives in Kathmandu, Nepal needed to devise storage for their palm leaf manuscripts—which also have clay seals—in order to combat fluctuations of temperature and humidity in their storage facilities which have no environmental controls. Palm leaf rolls were tied using twisted *Lokta* paper as a cord and then wrapped in 14gsm *Lokta* paper. Each was then labelled and placed in a custom-made archival-grade box with individual compartments, designed and assembled in Japan to hold up to 80 rolls. The storage box itself was constructed of strong archival boards with double outer walls which acted as a buffer to sustain a stable micro-climate. It also had a tightly fitting lid made from a polypropylene-coated board to discourage insect attack, degradation from dust and pollutants, and make the box waterproof.⁷¹

The Austrian National Library produced acid-free, custom-made, archival storage boxes for their collection of palm leaf manuscripts. They placed a sheet of polyethylene fleece (Tyvek® 1622 E) between each leaf and

⁷¹ Takagi, Chudo, and Maeda, 'Conservation and Digitisation of Rolled Palm Leaf Manuscripts'.



Fig. 4 Wooden manuscript cabinet with carved decorations of *Kinnari* in lacquer and gilt. Central Thailand, British Library, Foster 1058, nineteenth century.

72 Nief, Baatz, and Eyb-Green, 'Kammavacas: Lacquered and Gilt Manuscripts', 25.

73 From email conversations with Joanna Kosek, Head of Pictorial Art Conservation at the British Museum in June 2020.

threaded them to the binding structure to avoid any potential abrasion or rubbing of leaf on leaf. The use of Tyvek® as compared to paper was deemed to be much softer and did not fray. Unbound manuscripts were put in separate archival folders before placing them in their archival boxes.⁷²

At the British Museum in London palm leaves from the Southeast Asian collections were originally stored in boxes which contained several different-sized manuscripts. This necessitated frequent handling and caused further damage to the manuscripts. A rehousing programme to store their conserved palm leaf manuscripts was begun and they are now stored in shallow sliding drawers, housed in single rows, wrapped in acid-free tissue, to ensure easy access and to eliminate any more handling damage.⁷³

The University of Cambridge Library also needed to rehouse their palm leaf manuscripts and devised a new enclosure and box for their collections. Conservators utilised a segmented foldable inner wrapper, designed to mitigate risks and protect the delicate edges of stacked leaves, often irre-



Fig. 5 An example of palm leaf manuscript storage at the British Library. Due to the large number of items, some of the blue buckram boxes have been stacked in shallow shelves (which is not ideal).

gular in shape, and reduce the risk of the leaves being damaged by being jostled. The inner wrapper was designed to secure four sides of the irregularly shaped leaves while offering soft cushioning to protect them. To do this the wrapper was finished in 'aerolinen' and each side held together using embedded magnets; the wrapped bundle was then placed in a specially designed drop-back box covered in archival cloth and labelled in gold leaf on leather.⁷⁴

At the Metropolitan Museum of Art in New York complete palm leaf manuscripts are interleaved and stored in standard-size Solander boxes ('clamshell cases'). For the storage of incomplete manuscripts—both leaves or fragments—conservators were inspired by the creators of the manuscripts and adopted a simple solution for housing and fragments with missing covers were stacked and housed between two rectangular pieces of acid-free corrugated board, all with identification labels, then wrapped and tied with cotton twill cordage. The corrugated boards were

⁷⁴ Gretchen Allen, 'Boxing Clever, Round 1: Thinking Inside the Box', Cambridge Library Special Collections, blog post, January 2017, <https://specialcollections-blog.lib.cam.ac.uk/?p=13788> (accessed March 2021).

75 van Dyke, 'Sacred Leaves', 93.

76 Rachman, 'Palm Leaf Manuscripts from Royal Surakarta', 240.

77 Eve Menei, 'Conservation of a Palm Leaf Manuscript', Preprints of the IADA International Symposium, May 2017, Oslo: 65.

78 Catarina Figueirinhas, Ashleigh Schieszer, and Chris Voynovich, 'Nineteenth Century Buddhist Religious Treatise', University of Cincinnati Library Preservation Lab, blog post, posted by Holly Prochaska, November 2016, <https://blog.thepreservationlab.org/tag/palm-leaf> (accessed 8 January 2023).

79 Jacobs, 'Workshop Notes', 26–7.

oversized to allow for any slight shifting or uneven stacking. Boxing vulnerable and brittle palm leaf manuscripts in four-walled or drop-spine boxes was deemed unsuitable as they were thought to potentially increase the risks of damage when accessing and handling them.⁷⁵

At the Rekso Pustoko Library in Surakarta, Indonesia, palm leaf manuscripts are kept in locked glass cabinets, kept stored horizontally and stacked on top of each other without protective boxes.⁷⁶

At the Musée Savoisien in Chambéry, France, single palm leaves were humidified, repaired with isinglass and inlaid between four layers of toned Japanese paper, supported by two sheets of glass sealed with kraft paper. No boxing was mentioned in the source article.⁷⁷

The University of Cincinnati Library Preservation Lab devised a new enclosure to include a surrogate copy of a palm leaf to sit alongside the original manuscript. The surrogate was housed in a double-sided window mount and fastened with rare-earth magnets supported by Vivak® polyester film (polyethylene terephthalate glycol). This was housed with the original palm leaf (with boards) in a bespoke drop-back box to avoid handling of the fragile manuscript and to be easily seen and displayed when the enclosure was opened.⁷⁸

2b General storage guidance

The British Library, along with other museums and libraries, advocates wrapping palm leaves in cloth before storing in boxes. Where original boards are missing, acid-free boards made of mount board are cut to size to protect the manuscript prior to wrapping and should be only slightly bigger than the leaves. In the past, acrylic sheets have been used but this is no longer considered good practice at the British Library. Boxes should be custom-made buckram drop-back boxes ideally, or a phase box if this isn't possible due to time or budget constraints. It is advisable to avoid stacking boxes on top of each other, especially if housed in phase boxes. Appropriate environmental conditions for storage are also very important and at the British Library, the target environment is to maintain a temperature of 16–19°C with 50±5% Relative Humidity.

3 British library boxing and storage

The boxing method shown below for a Thai palm leaf manuscript, Or.16977, offers another solution for wrapping manuscripts using a thin sheet of Bondina® polyester paper and the package then stored in a bespoke drop-back box. The box is padded out with Plastazote® foam, which is adhered with double-sided tape on all sides of the box for cushioning, and covered in a burgundy Buckram, as specified by the curator. In this case, there was an existing box to be re-used but with added foam padding as requested by the curator, which meant as there wasn't enough room to wrap the manuscript in aerocotton, it was wrapped in Bondina® instead. This work was completed in 2019 by Lea Havelock, one of the conservators at the British Library (see Figs 6 and 7).

David Jacobs, a now retired former conservator and conservation team leader at the British Library, described how after treatment palm leaves should be restrung with cord, wrapped in their original wrapper or unbleached cotton cloth such as calico, and then boxed in a buckram drop-back or Solander box.⁷⁹ In recent years some manuscripts with damaged or warped boards were given Perspex support boards (see Fig. 8); however, these were not well received by curators at the British Library and the practice has been discontinued.

Palm leaves are sometimes housed in temporary packaging of a phase box tied with tape, prior to being stored in a drop-back box according to Rick Brown, a current conservator and team leader at the British



Fig. 6 A Pali palm leaf manuscript with gold and lacquered wooden cover boards housed in a drop-back box. Northern Thailand, British Library, Or. 16977, nineteenth century.



Fig. 7 A Pali palm leaf manuscript with gold and lacquered wooden cover boards wrapped in Bondina® and housed in a drop-back box, 2019. Northern Thailand, British Library, Or. 16977, nineteenth century.

Library. In addition, fragments or individual palm leaves from incomplete manuscripts are sometimes stored in archival envelopes or wrapped in acid-free tissue. All palm leaf manuscripts, whether complete or bundles of fragments, should be boxed individually due to their fragile and organic nature. This helps protect the manuscripts from potential fire or water damage and allows for safer handling, especially in an emergency situation. Boxes should ideally be a drop-back box, covered in waterproof conservation-grade buckram. More recently the British Library conservation team under Brown have been using a new flap front drop-back box design, for even greater ease of handling (see [Figs 9](#) and [10](#)). When the lid is lifted, the front panel flaps down so the object can be slid out without picking it up while it's still in the box. This style of box also works well for scrolls and other delicate objects.

Religious and ethical issues

Palm leaf manuscripts have great significance historically, culturally and spiritually, which can be imparted from the individual who commissioned the manuscript, the inscriber or from the specific context of the manuscript itself. Manuscripts range in subject from historical accounts to customary



Fig. 8 British Library palm leaf manuscript of sacred Tamil hymns (*Tēvāram*) from the eighteenth century, Or. 12212, tied with a loop, knot and wooden pointer, shown with Perspex® support boards and modern calico wrapper.

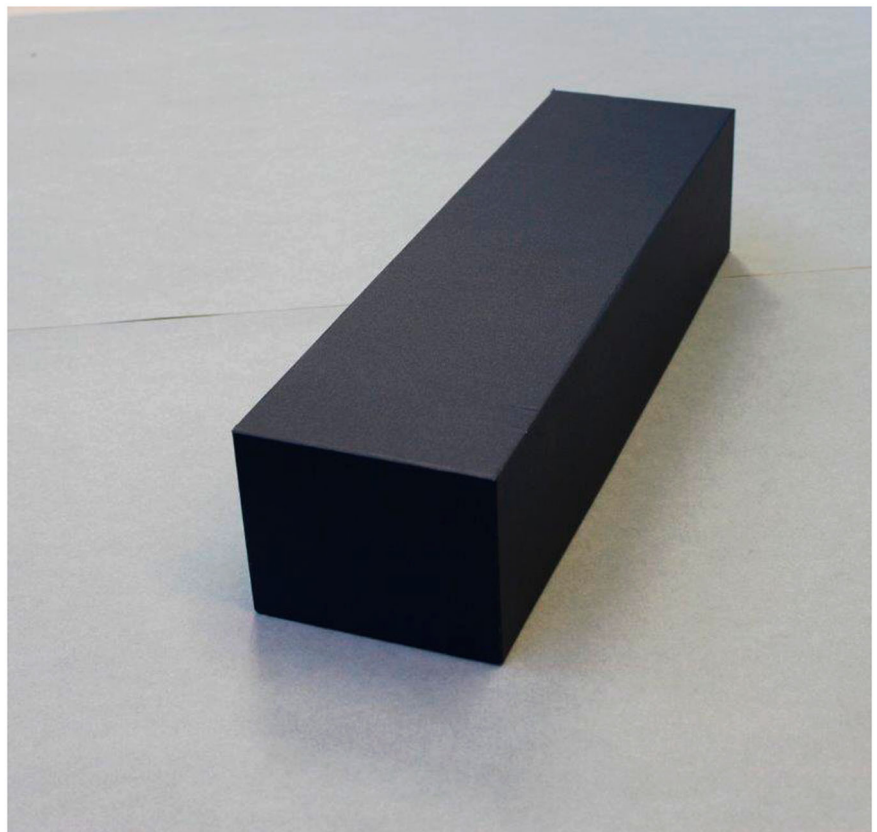


Fig. 9 Closed flap front drop-back box, 2022.

laws, ceremonies, astrology, literary texts, traditional medicine or religion, and allow researchers to gain insight into the interaction between the manuscripts and the communities who create and use them. Some traditional

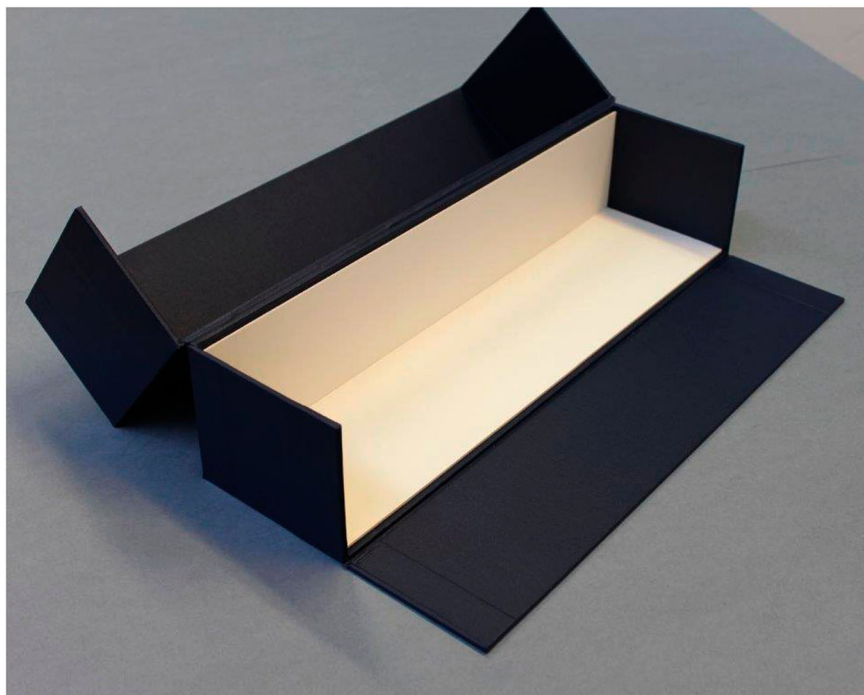


Fig. 10 Fully open flap front drop-back box. Box design created by Rick Brown at The British Library, 2022.

texts have been lost over time due to cultural change, such as the discouragement and banning of using palm leaves to create manuscripts.⁸⁰ This in turn has led to the loss of written languages such as the Lanna script, as well as the knowledge contained within these manuscripts.

1 Religious texts

The most common religious texts found in palm leaf manuscripts are Buddhist, Hindu, Jain and Islamic. It could be argued that because some religious practices only live on through oral tradition and are rarely written down, palm leaf manuscripts are sometimes the last testament to these religious traditions. Religious texts were read and recited during ceremonies, as well as being for individual reflection. Since these manuscripts are spiritual, there needs to be further consideration when handling and conserving them.⁸¹

In Southeast Asia Buddhist religious texts were often created as an offering to honour a deceased individual.⁸² The texts were commissioned as a final act of veneration for the deceased and placed within the temple.⁸³ This practice of gaining merit by offering a palm leaf manuscript is called *TanTham* or *TanDharma*. The manuscript is offered to a monastery and dedicated to the Buddhist faith, the inscriber and ancestors. This practice is also seen in other religions where religious texts and icons are commissioned as an offering. It is believed that having a religious text commissioned during a person's life or after their passing allows past transgressions to be forgiven, thus allowing the deceased person to progress in the afterlife. Such manuscripts were occasionally elaborately decorated, including being illuminated. In the Lanna culture the last leaf in a palm leaf manuscript (*khamphi bailan*) has information pertaining to which monastery created the manuscript, as well as for what purpose and who the sponsor was.⁸⁴

In the *Theravāda* tradition of Buddhism, palm leaf manuscripts were created to record Buddhist scriptures.⁸⁵ These were made using either palmyra or talipot palm leaves, and were usually fairly simplistic in design

⁸⁰ Piyapat Jarusawat, Andrew Cox, and Jo Bates, 'Community Participation in the Management of Palm Leaf Manuscripts as Lanna Cultural Material in Thailand', *Journal of Documentation* 74, no. 5 (September 2018): 952.

⁸¹ Jarusawat, Cox, and Bates, 'Community Participation in the Management of Palm Leaf Manuscripts', 952–5.

⁸² Melodie Doumy et al., 'Illuminated Buddhist Manuscripts—Manuscript Art from Southeast Asia', *Discovering Sacred Texts* Article, November 2019, <https://www.bl.uk/sacred-texts/articles/illuminated-buddhist-manuscripts> (accessed February 2021).

⁸³ Jarusawat, Cox, and Bates, 'Community Participation in the Management of Palm Leaf Manuscripts', 957.

⁸⁴ Jarusawat, Cox, and Bates, 'Community Participation in the Management of Palm Leaf Manuscripts', 952.

85 Doumy et al., 'Illuminated Buddhist Manuscripts'.

with only small drawings decorating the text on occasion. In the Thai and Mon cultural traditions in Thailand, manuscripts were sometimes gilded or silvered before being inscribed.

86 Jarusawat, Cox, and Bates, 'Community Participation in the Management of Palm Leaf Manuscripts', 959.

2 Traditional manuscript storage, preservation and custodianship

In many Buddhist monasteries across Southeast Asia where manuscripts are stored, as with the Dambulla Rock Cave temple in Sri Lanka indicated in Fig. 11, the outside is decorated with Himmapan (mythical) creatures to protect the sacred artefacts from danger. The responsibility of managing and caring for palm leaf manuscripts in these Buddhist monasteries still usually lies with men as the institutions have patriarchal roots.⁸⁶ Women are typically only involved in the weaving of covers or the binding the cords, although this is beginning to change in Southeast Asia. Manuscripts are kept securely in locked cupboards or rooms and permission required before people can see the texts. Attitudes are also changing, with some manuscripts being placed on display more often to attract visitors and to please community members who fear that if the manuscripts are not seen they will be lost. In northern Thailand *TakTham* ceremonies, held annually to clean and preserve the manuscripts, have also become more popular and involve a procession with the final destination of the palm leaf manuscripts being the temple pagoda. During the procession the manuscripts are carried from the repositories or monasteries to the temple in a lavish procession with manuscripts often being carried by monks or priests. Those who participate earn spiritual merit while the ceremony allows the community to interact with the manuscripts. The manuscripts are cleaned and then laid out to dry in the morning sun during the ceremony, which allows a better inspection of the manuscripts. Cloth wrappers in poor condition are usually changed as part of the *TakTham* ceremony.⁸⁷

87 Jarusawat, Cox, and Bates, 'Community Participation in the Management of Palm Leaf Manuscripts', 960.

Practices around Hindu and Jain religious texts are fairly similar to each other. In both religions the most spiritual texts are only handled by spiritual leaders and kept stored in their respective temples. In the case of Hinduism, priests (*Pujar*) or holy people are used to safeguard their most prized texts, and in some cases they are the only people who can handle them. Jainism has no priests and shares some beliefs similar to Hinduism and Buddhism, although it has no priests, rather nuns and monks. As part of their vow of non-violence, Jain nuns and monks view their religious texts with their mouths covered in order not to harm any living organisms while learning about their teachings.⁸⁸

88 Paul Dundas, Umakant Premanand Shah, and G. Ralph Strohl, 'Jainism', *Encyclopedia Britannica*, 10 February 2021, <https://www.britannica.com/topic/Jainism> (accessed October 2021).

3 Adhesives

Buddhists, Hindus and Jains typically have a lacto-vegetarian diet, which means certain adhesives are not acceptable for use in conservation treatment. As mentioned in conversation by our former Burmese curator, San San May, in some cases Buddhists do eat animal products so long as the

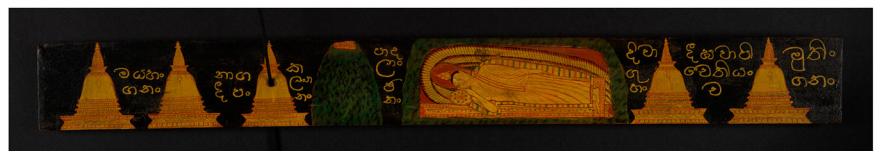


Fig. 11 Front cover board of palm leaf manuscript in Pāli and Sinhalese text containing Buddhist commentaries (*atthakathā*) and instructions (*nissāya*). The covers are illustrated with sacred Buddhist sites in Sri Lanka, including Buddha's footprint at Adam's Peak, the Bodhi tree in Anuradhapura, and Dambulla Rock Cave. British Library manuscript Or. 6603/258 from Sri Lanka, dated 1756 (wooden covers from 1853).

animals have not been slaughtered especially for them; therefore, it is sometimes possible to use animal-based adhesives when treating Buddhist manuscripts. Ethically speaking, plant-based adhesives are best for palm leaf conservation, but if isinglass is considered necessary then it can be acceptable for Buddhist or Muslim cultures as it's fish-based, but it is not acceptable for use on Hindu or Jain manuscripts as they are more strictly vegetarian. Most adhesives can be used on Islamic manuscripts except those made from pigs as these are *haram* (forbidden).

4 Photography and display

With regard to photography and the display of manuscripts that originate from the four religions discussed—Islam, Buddhism, Hinduism and Jainism—it would be best practice to seek approval and input from each religion's representatives as to how they might be photographed or displayed according to religious beliefs. For example, some religious practices dictate that the text can only be viewed on certain holy days, or by certain people and genders.⁸⁹ It should also be noted that dilemmas may arise when discussing the conservation of these manuscripts as local beliefs and professional ideals may vary, as well as inter-generational differences towards the treatment of these sacred objects (see below).

5 Manuscripts as sacred objects

Depending on the context, the text within palm leaf manuscripts could be seen to be less important than the whole object itself, as together its components—the leaves, boards, wrapper, cord and box—give an insight into the identity of the people who created them. At times the palm leaf manuscript itself is the sacred object, with ceremonies being held to show respect for it and not the religious text within. This can sometimes be related to inter-generational differences with an older generation more likely to associate the manuscripts with their original location or keeper which increases their spiritual significance for them, while a younger generation, as well as researchers or experts, may only regard it for the knowledge written within. In some communities nowadays there are often only a few people who can read the text that the manuscript is written in, so the input of researchers and other experts to help reconstruct the knowledge held in these texts is required.⁹⁰

As described, many palm leaf manuscripts have textile wrappers which are often in very poor condition and historically were replaced rather than retained by their religious custodians. Replacing the wrapper is a common traditional practice in all four of the religions discussed above and the art of rewrapping a manuscript after the original textile has been lost or heavily damaged is seen as a sign of respect. However, the original wrapper is an integral part of the manuscript and often contains information on its origin and historical use, which in the Buddhist tradition adds meritorious value to the scripture; believers usually will have commissioned the wrapper or had it made as a religious offering.⁹¹

Similarly, boards are an intrinsic part of the manuscript and like the wrapper should always be preserved and retained, even if their condition is so poor that the manuscript needs to be stabilised with additional new boards. The original wooden or bamboo boards are usually decorated or carved with ornaments representing flowers, deities (*devas*) or animals, and so any part of the original boards contains valuable information that should be preserved. As discussed, boards can be lacquered and embellished with gold or silver leaf, mirror glass or mother of pearl inlay. In Sri Lanka the Buddhist manuscript covers are painted in vibrant colours depicting the life of Buddha, the *Jātakas*, Buddhist symbols or floral ornaments. Some Sinhalese palm leaf manuscripts have decorative silver covers, or in a

⁸⁹ Jarusawat, Cox, and Bates, 'Community Participation in the Management of Palm Leaf Manuscripts', 952–3.

⁹⁰ Jarusawat, Cox, and Bates, 'Community Participation in the Management of Palm Leaf Manuscripts', 957.

⁹¹ Jarusawat, Cox, and Bates, 'Community Participation in the Management of Palm Leaf Manuscripts', 960.

92 Jana Igunma, 'The Beauty of Palm Leaf Manuscripts (1): Central Thailand', 20 November 2014, <https://britishlibrary.typepad.co.uk/asian-and-african/2014/11/the-beauty-of-palm-leaf-manuscripts-1-central-thailand.html> (accessed June 2020).

93 Igunma, 'The Beauty of Palm Leaf Manuscripts (3)'.

94 Jarusawat, Cox, and Bates, 'Community Participation in the Management of Palm Leaf Manuscripts', 961–2.

few rare cases the entire manuscript is created from silver sheets shaped as palm leaves. This is also found in the Burmese tradition where manuscripts can be made from lacquered cloth (usually from strips of monks' robes), ivory, gold, silver or other metals in the shape of palm leaves.⁹²

Manuscript chests should be kept and stored with the items, given they are part of the palm leaf manuscripts' context and link the present to the ancestors of the past.⁹³

In addition, ethical considerations dictate that palm leaf manuscripts should not touch the floor and should be elevated above the waist where possible; to hold a manuscript below this level is considered to be disrespectful in all of the four religions mentioned. Texts should be handled and stored with care, as demonstrated by the decorated cupboards and chests they are traditionally stored in. Manuscripts should be allowed to be viewed by the communities who hold them in great regard, with the possibility of being handled if appropriate as part of the culture of reverence. Each part of the palm leaf manuscript has a hidden meaning for the cultures who created them and represent a community's ancestral crafts and beliefs.⁹⁴ Appreciating palm leaf manuscripts as both sacred objects and for the knowledge contained in their texts, researchers and members of their community may unite in a shared purpose to reconstruct cultural and linguistic knowledge and belief systems.

Conclusions and recommendations

The research carried out for this review has highlighted a need for consistency in the approach to conserving palm leaf manuscripts. This is a developing area of conservation, to which it is hoped this review will contribute. Below are the key findings from the review.

1 Regional variations

Palm leaf manuscripts represent a complex and diverse range of objects with a huge variety of physical characteristics and distinct regional variations, often shown in the style of wrapper or the presence of lacquer. These variations are heavily influenced by the types of palm trees the manuscripts are made from, which dictate the size and type of leaf that can be used to create these objects. As such, each type of leaf has helped to give rise to the local traditions based on what works best for that leaf. For example, manuscripts made with palmyra leaves were rarely surface written because the leaves were darker and waxier than the talipot leaves, and thus less able to absorb writing media.

2 'No one size fits all' approach

Due to the unique nature of these manuscripts and the enormous variety of characteristics, sizes and materials used, the conservation of each item can differ significantly. At the British Library there is 'no one size fits all' approach and each palm leaf manuscript must be treated on its own merits as part of a case-by-case approach. Effective communication with curators, subject specialists and the related communities where possible is vital to understanding the approach needed to treat the material appropriately. These discussions should lead to an agreement on what type of treatment would preserve the item best for the future.

3 Understanding historic preservation traditions

Historic preservation traditions should not be ignored, but be understood as something to learn from, even if they include methods not used in Western approaches to conservation. Documentation and identification are key elements prior to treatment. Historic preservation techniques can sometimes be seen as more important to researchers than the text itself

as they allow others to better understand the manuscripts' material components.

4 Minimal intervention

For conservation treatment, the principle of minimal intervention is very appropriate as it helps prevent irreversible loss or damage to the original manuscript. To over-serve an item of cultural and religious significance would lose some of the original context of the object, such as leaf textures or bore holes from insects, which only need to be conserved if they affect the stability of the object.

5 Digitisation considerations

Some palm leaf manuscripts may need to be prioritised for digitisation for a range of reasons, including to avoid further damage from handling. Uninked manuscripts, for example, would be better viewed by the researcher using a digital copy as this would allow them to change the contrast of the text allowing it to be read more easily, rather than permanently altering the original by re-inking its surface.

6 Retain all elements of the object

Original wrappers and boards should always be preserved and retained after conservation, either reattached to the palm leaf manuscripts or stored together with the conserved items. If original boards or wrappers are lost, it's best to discuss the different options available with curators and suggest various methods available, such as new wrapping materials. A suggested wrapping method to use with new cotton wrappers is described in the Appendix *Recommendations for best practice*. Suitable boxing and storage is crucial for longevity, as is good handling practice.

7 Handling instructions and training for library and museum staff and researchers

Creating detailed but simple handling instructions placed inside the drop-back buckram boxes can lead to improved handling practice for those working with collections such as curators, imaging specialists and researchers. Further training for reading room staff in libraries and museums would also help maintain the manuscripts' condition.

One of the main lessons learned by conservators at the British Library who carried out this project was the scale of the regional differences in palm leaf manuscript traditions, from the beautifully ornate and decorative manuscripts of Thailand, to some of the more functional but equally important manuscripts used for record keeping in India. This huge variety of characteristics among manuscript traditions makes it very important for conservators to work hand-in-hand with curators, scholars and communities to treat this material with the appropriate knowledge and respect it deserves.

Literature review and other appendices

Please see the Appendices for the *Recommendations for best practice* document and two decision-making flowcharts—one for conservators and one for curators. Our Annotated Bibliography and further results of the survey can be found on the British Library's Open Access Repository.⁹⁵

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⁹⁵ Supporting documentation for A Literature Review of Palm Leaf Manuscript Conservation: Parts 1 and 2: <https://doi.org/10.23636/8hbd-xj49> (accessed 16 December 2022).

Appendix 1

Recommendations for best practice

Palm leaf manuscripts and paintings represent a complex range of objects with a huge variety of types and sizes and national traditions with strong regional variation. These variations are heavily influenced by the types of palm trees they are made from, which dictates the size and type of leaf that can be used to create these objects. As such, each type of leaf has helped to give rise to the local traditions based on what works best for that type of leaf.

The research carried out for this review has highlighted a lack of consistency in the approach to conserving and especially repairing palm leaf manuscripts. This is a developing area of conservation, to which it is hoped this review will contribute. The following points are meant to be used as guidance for conservators when assessing palm leaves and making treatment decisions.

- There is no one size fits all approach, it must be a case-by-case decision for conservation treatments due to the diversity of types of palm leaf manuscripts.
- Good communication with curators and subject specialists is vital to understanding the object(s) and choosing the correct treatment.
- Historic preservation traditions should not be ignored, but understood to be learnt from, even if those methods are not used in a Western conservation approach.
- Manuscripts, especially religious texts, should not touch the floor; they should be elevated, handled and stored with care at all times.
- Minimal intervention is more appropriate and prevents irreversible damage or loss.
- Un-inked manuscripts should be prioritised for digitisation, rather than re-inked or re-oiled.
- The most useful adhesives are methyl cellulose, wheat starch paste and isinglass—but only when appropriate to materials and culture as, for example, fish-based adhesives should not be used on Hindu or Jain manuscripts. Plant-based adhesives are best ethically, but if isinglass (or fish glue) is absolutely necessary then it can be acceptable for Buddhist or Muslim manuscripts, but not for Hindu or Jain items as culturally these are strictly vegetarian cultures.
- When necessary, gentle and slow humidification is best for conserving both lacquered and unlacquered manuscripts due to the inherent nature of palm leaves.
- Damaged boards should be repaired where possible, and augmented with support boards cut from mount board, slightly bigger than the item to protect the edges. Old boards should always be kept with the object in a box if not in use. Perspex® sheet should not be used.
- Good boxing and storage is crucial for the longevity of palm leaf manuscripts, as is good handling practice.

Boxing

Wrappers, cords and labels should be housed in the same box as the manuscript; original cords and labels can be put in a Melinex® sleeve if no longer attached to the manuscript. Drop-back buckram boxes with original or new unbleached cotton (calico or aerocotton) wrappers inside to stabilise the manuscript are best; each manuscript should be boxed individually where possible. A phase box would be better than nothing as a temporary solution, but generally they are not appropriate in the long term.

If there's no original wrapper, a new calico or aerocotton wrapper with its edges cut with saw-toothed scissors ('pinking shears') to create a

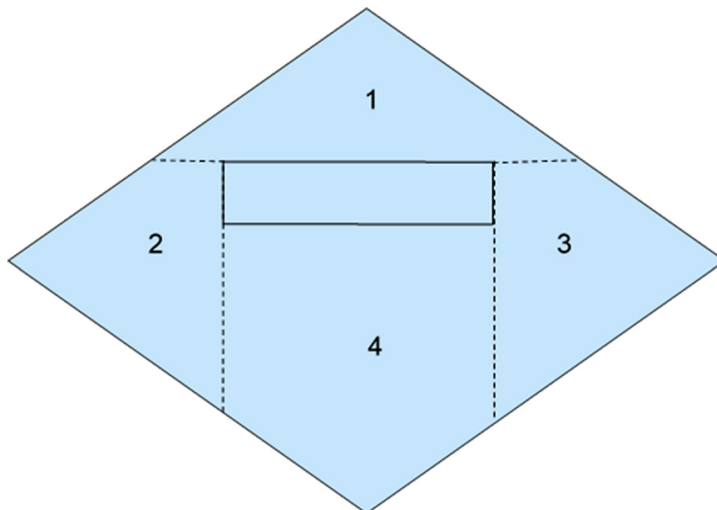


Fig. 12 British Library palm leaf manuscript from the eighteenth or early nineteenth century, Add MS 11553, shown with a modern calico wrapper with edges cut using pinking shears to prevent fraying and Perspex® boards before replacement, as well as a separate smaller bundle containing an unusual wooden wrapper.

zigzag pattern that won't fray can be used (see [Fig. 12](#) and the diagram below).

Handling instructions should be placed in the box, and they should emphasise not to overtighten the cords and that they should be loosened when reading the manuscript, but not removed. A list of accessories should be provided in the box that indicate what should be there such as a wooden pointer, wrapper, cords, labels and so on ([Fig. 13](#)).

Suggested wrapping method for new cotton wrappers



- Place manuscript towards the corner of the wrapper as shown in diagram.
- Fold the corner (section 1) over the manuscript.
- Fold in sections 2 and 3 toward the centre, with one section lying on top of the other, as smoothly as possible.
- Wrap the section 4 around the manuscript while holding the manuscript, do not turn the manuscript over on itself to wrap

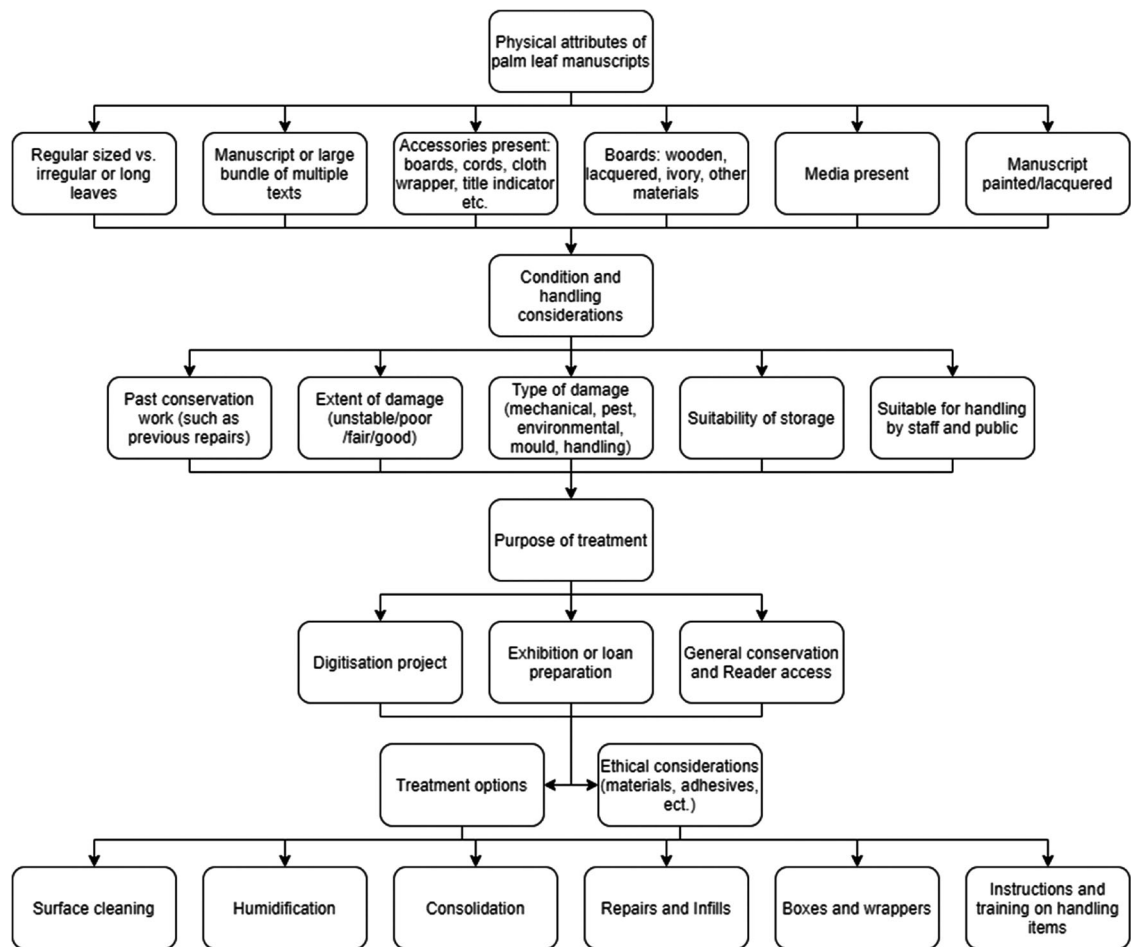


Fig. 13 British Library palm leaf manuscript of sacred Tamil hymns (*Tēvāram*) from the eighteenth century, Or. 12212, shown with modern calico wrapper, wooden pointer and cord loosened to facilitate reading.

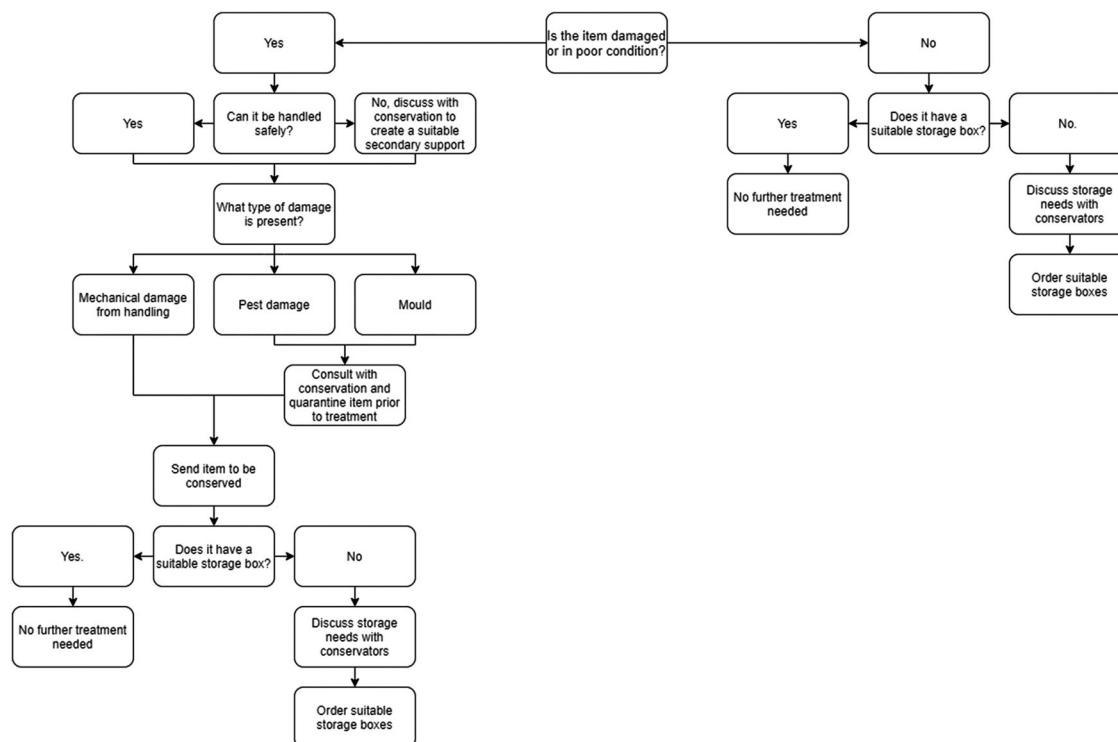
Appendix 2

The following flowcharts are meant to be used as guidance for conservators and curators working in heritage institutions when assessing palm leaves and making conservation treatment decisions. They're designed as a series of questions to help the conservator or curator consider what a manuscript may need based on its condition and physical characteristics.

Decision-making flowchart for conservators



Decision-making flowchart for curators



Acknowledgements

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Résumé

« Une revue littéraire de la restauration des manuscrits sur feuilles de palmier—Partie 2: traitements de conservation historiques et actuels, conditionnement et stockage, questions religieuses et éthiques, recommandations pour les meilleures pratiques »

La fermeture de la British Library lors de la pandémie de Covid-19 2020–2021 a permis au département de la restauration d'entreprendre un recensement des traitements de conservation des manuscrits sur feuilles de palmier afin de prendre des décisions plus éclairées sur le traitement de ces objets complexes. Dans le cadre du recensement, un questionnaire fut posté en 2020 sur le Forum international de la conservation comprenant des questions sur le traitement des manuscrits

sur feuilles de palmier réalisé par d'autres personnes dans ce domaine. Cette revue de la littérature en deux parties exploite la littérature disponible et les résultats de l'enquête pour aborder le large éventail de problèmes inhérents à la conservation matérielle des matériaux en feuilles de palmier. La partie 1 a commencé par un aperçu historique des manuscrits sur feuilles de palmier et de leur production, des méthodes de préparation des feuilles, des matériaux et supports manuscrits, des manuscrits sur feuilles de palmier à la British Library et des altérations courantes rencontrées dans ces manuscrits. La partie 2 détaille les anciens traitements et les techniques de conservation actuelles que nous avons observées et qui ont été exprimées dans notre enquête, ainsi que les problèmes de stockage, les questions religieuses et éthiques. Il se termine par deux organigrammes de prise de décision et nos recommanda-

tions pratiques pour les restaurateurs. Les auteurs souhaitent partager les informations rassemblées aussi largement que possible et aider à créer une plus grande continuité et cohérence dans la conservation des manuscrits sur feuilles de palmier en présentant des recommandations de bonnes pratiques pour les restaurateurs qui traitent ces objets étonnants.

Zusammenfassung

„Eine Literaturübersicht über die Restaurierung von Palmblattmanuskripten—Teil 2: historische und aktuelle Restaurierungsverfahren, Verpackung und Lagerung, religiöse und ethische Fragen, Empfehlungen für "best practice" Verfahren“

Die Schließung der British Library während der COVID-19-Pandemie in den Jahren 2020–2021 ermöglichte es der Konservierungsabteilung, eine Überprüfung der konservatorischen Behandlung von Palmblatthandschriften vorzunehmen, um fundiertere Entscheidungen über die Behandlung dieser komplexen Objekte treffen zu können. Im Rahmen dieser Überprüfung wurde 2020 ein Fragebogen an das Global Conservation Forum geschickt, in dem nach der Behandlung von Palmblattmanuskripten durch andere Fachleute gefragt wurde. Diese zweiteilige Literaturübersicht nutzt die verfügbare Literatur und die Ergebnisse der Umfrage, um das breite Spektrum an Fragen zu behandeln, die mit der praktischen Konservierung von Palmblattmaterialien verbunden sind. Teil 1 beginnt mit einem historischen Überblick über Palmblattmanuskripte und ihre Herstellung, Blattpräparationsmethoden, Manuskriptmaterialien und -medien, Palmblattmanuskripte in der British Library und die in solchen Manuskripten häufig vorkommenden Schadensarten. Teil 2 befasst sich mit den historischen Behandlungsmethoden und den aktuellen Konservierungstechniken, die sich aus unserer Untersuchung und Umfrage ergeben haben, sowie mit der Lagerung, religiösen und ethischen Fragen. Er schließt mit zwei Flussdiagrammen zur Entscheidungsfindung und unseren praktischen Empfehlungen für Restauratoren. Die Autoren möchten die gesammelten Informationen so weit wie

möglich verbreiten und dazu beitragen, eine größere Kontinuität und Konsistenz bei der Erhaltung von Palmblatthandschriften zu schaffen, indem sie Empfehlungen für bewährte Verfahren für Restauratoren, die diese großartigen Objekte behandeln, vorlegen.

Resumen

“Una revisión bibliográfica sobre la conservación de manuscritos de hoja de palma. Segunda parte: tratamientos de conservación históricos y actuales, embalaje y almacenamiento, cuestiones religiosas y éticas, recomendaciones para las mejores prácticas”
El cierre de la Biblioteca Británica durante la pandemia de Covid-19 de 2020 al 2021 permitió al departamento de conservación llevar a cabo una revisión de los tratamientos de conservación de manuscritos en hoja de palma y así poder tomar decisiones más fundamentadas en relación con el tratamiento de estos complejos objetos. Como parte de la revisión, en 2020, se envió un cuestionario al Global Conservation Forum preguntando a otros conservadores sobre el tratamiento de manuscritos de hojas de palma. Esta reseña bibliográfica en dos partes utiliza la literatura disponible y los resultados de la encuesta para abordar la amplia problemática de la conservación práctica de los materiales de hoja de palma. La primera parte incluía una descripción histórica de los manuscritos en hoja de palma y su producción, los métodos de preparación de la hoja, los materiales y medios usados en los manuscritos, los manuscritos en hoja de palma existentes en la Biblioteca Británica y los tipos de daños comunes a dichos manuscritos. La segunda parte detalla los tratamientos históricos y las técnicas de conservación actuales según lo informado por nuestra revisión y encuesta, así como cuestiones de almacenamiento, religiosas y éticas. Concluye con dos diagramas de flujo para facilitar decisiones sobre tratamientos y nuestras recomendaciones prácticas para los conservadores. Los autores desean compartir la información recopilada lo más ampliamente posible y presentar nuestras recomendaciones de mejores prácticas para los conservadores que tratan estos objetos fascinante para así ayudar a crear mayor continuidad y consistencia en la conservación de manuscritos de hoja de palma.

摘要

有关保护棕榈叶手稿的文献回顾——第二部分：历史上的和当前的保护技术、装箱与存储、宗教和伦理问题，以及最佳实践建议
大英图书馆在2020–2021年新冠疫情期间关闭，使得保存修复部可以对棕榈叶手稿的保护进行审查，以便在修护这类复杂藏品时做出更明智的决定。作为审查的一部分，2020年大英图书馆在全球保护论坛上发布了一份调查问卷，询问了该领域其他人员对棕榈叶手稿的修护情况。这篇由两部分组成的文献综述使用了现有文献和调查结果，以探讨棕榈叶材料在保护实践中所涉及的广泛问题。
第一部分首先是棕榈叶手稿及其制作的历史概述、叶子的制备方法、手稿材料和媒介、大英图书馆的棕榈叶手稿，以及在此类手稿中发现的常见损伤类型。第二部分详细介绍了我们审查和调查所了解到的历史处理方法和当前保护技术，以及存储、宗教和伦理问题。最后两张决策流程图，以及我们对修复师的实际建议。
作者们希望尽可能广泛地分享这些整理过的信息，并通过向修护这些非凡物件的修复师建议最佳做法，来帮助促进棕榈叶手稿保护的连续性和一致性。

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