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Towards the Investigation of Material Choices in Written Artefacts: Methodological Reflections

Colini, Claudia; Heiles, Marco; Maksimczuk, José; Armstrong, Abigail; Aspiotis, Stylianos; Berthold, Cornelius; Bonnerot, Olivier; Creydt, Marina; Fedeli, Alba; Grigoriadou, Katerina; Jaengsawang, Silpsupa; Kohs, Michael; Marotta, Giuseppe; Mascia, Leah; Nassan Agha, Joud; Raschmann, Simone-Christiane; Reck, Christiane; Ruzzier, Chiara; Sathiyamani, Sowmeya

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**Towards the Investigation of Material Choices in Written
Artefacts: Methodological Reflections**

This Occasional Paper is the result of the discussion held in 2022–2024 within Research Field K (RFK) – ‘Selecting Materials’, part of the Cluster of Excellence ‘Understanding Written Artefacts (UWA): Materiality, Interaction and Transmission in Manuscript Cultures’ at the Centre for the Study of Manuscript Cultures (CSMC), University of Hamburg. RFK comprises researchers from various disciplines, both from the humanities and the natural sciences, bringing together a multitude of perspectives and aimed at comparatively investigating the options and choices involved in the selection of materials for creating written artefacts (WAs). Combining in-depth material, philological and historical analysis, the group seeks to determine the materials that were chosen to be used, to identify potential underlying patterns in these choices, and to understand the reasons behind them and the consequences they had for the preservation and circulation of the artefact. This paper sets out a preliminary framework for this approach, with the intention of laying a foundation for its future development.¹

A WA is ‘any artificial or natural object with visual signs applied by humans’.² Thus, it features two intertwined dimensions: material (the object) and content (the signs). The focus of this paper is not the content, which is produced by actors such as the writer of the artefact (e.g. a student jotting down some notes in their study notebook), or a commissioner (e.g. a professional scribe copying Dante’s *Divine Comedy* for a client), or a wider community (e.g. a monk copying a liturgical work for the monastery’s library). The

¹ The discussions carried out in 2022–2024 within the RFK have benefited from a series of guiding questions that scholars can ask when exploring material choices in WAs. We make these questions available to the scholarly community in the RDR. See <https://www.fdr.uni-hamburg.de/deposit/16627>

² Bausi et al. 2023.

paper concentrates on the material dimension that is defined by a complex series of interlinked choices articulating the intended content, the intended use, and other inherent characteristics of the envisaged WA to a variety of contextual factors. We call these ‘material choices’.

The material choices made during the production process play an essential role in the way users will subsequently interact with and transmit a WA. This Occasional Paper, which reflects the work in progress within RFK, provides a theoretical and methodological basis for the investigation of material choices. By analysing the rationale(s) behind the selection of materials in the creation of WAs, the added value of our approach concerns the broader lifecycle of WAs, enhancing our understanding of how the specific circumstances of production and the intended affordances of WAs guide producers throughout the production process. Following the interdisciplinary approach of the CSMC, our paper discusses WAs produced in different cultures and periods. This cross-cultural and diachronic perspective allows for comparisons, which highlight similarities in practices across time and space, and emphasise peculiarities that are specific to certain areas and contexts. Our methodology integrates approaches from the humanities and material sciences. It builds upon and expands on concepts and terminology formulated at the CSMC in the last decade (e.g. setting, pattern, multilayering, etc.).³

In this paper, ‘material choice’ is understood as **the realisation of a particular material option in a given WA**. This definition, in turn, rests on the following key concepts:

Material. We use the term in a broad sense to refer to: 1) anything that possesses matter used in the creation of a WA, for example paper for the writing support, carbon ink as the writing substance, and wood for the book cover; and 2) the physical feature of a WA such as its form (pothi, inscription, codex, scroll, etc.), size, weight, quire structure, visual organisation of the content, and style of script.⁴ Thus, ‘material’ in this paper comprises matter with its physical and chemical properties, and the way it is processed and used in the creation of a given WA.

Material options. Material options are shaped by the interaction of two elements:

³ See for example Wimmer et al. 2015, Wimmer 2023, Maksimczuk et al. 2024.

⁴ Our term ‘material’ aligns with the concept of ‘physical characteristics’, as defined in Wimmer et al. 2015. Under this term, they distinguished two subcategories: ‘material’ and ‘visual’ features. Both of these subcategories are encompassed within our definition of ‘material’.

- the characteristics of the *setting*⁵ in which a WA is created, that is, the temporal, geographical, environmental, cultural, social, political, technological, and economic circumstances of a given manuscript culture;
- the knowledge and capabilities of the individual producers,⁶ shaped for example by education, habits, skills and experiences.

Producers may act within a manuscript culture that has access to a range of materials from which the writing support can be chosen, such as papyrus, parchment, paper, rock, bronze, glass, porcelain, etc. However, if they are not aware that it is possible to engrave signs on bronze, they will not consider bronze among the potential writing supports, especially if there are other materials available that are better known to them. Accordingly, the material options at the disposal of a particular producer within a given production process depend not only on the technological development of a writing culture but also the availability of certain materials, as well as the capabilities of the producer to use (or not use) such materials for the creation of a WA (Fig. 1).

A material choice is thus made by one or more producers on the basis of the available material options. In order to create a WA, producers have to make a certain number of choices, according to the simplicity or complexity of the intended artefact in terms of its production. The choices are guided by factors related to the production setting and to the expected characteristics and affordances of the WA.⁷ There is no essential difference whether producers select a certain material as the result of a well-thought-out plan (e.g. in the preparation of a palm-leaf manuscript) or following a seemingly spontaneous decision or writing need (e.g. in the act of drawing a doodle in the sand). Even if there is only one material option available to the producer, the fact that they take that option

⁵ Here, we build on the specific definition of 'setting' by Wimmer et al. 2015. They define it as "the social, economic, cultural, spatial and temporal framework in which a manuscript is produced and used" (Wimmer et al. 2015: 5).

⁶ By producers, we mean all the actors involved in the creation of a WA and its parts (writer, rubricator, miniaturist, binder, carver, commissioner, etc.). Partially related to 'producer' is the heuristic term 'originator', which refers to an agent that makes a WA to be perceived and valued as 'special'. The originator of a WA could be identical to its producer or be a different agent (e.g. the author of the content of the WA, or recipients of the WA such as the scholarly community, political powers, hosting institutions, subsequent owners, etc.). Since 'producer' covers a broader spectrum of creators of WAs and always refers to people in some way responsible for its physical creation, we adopt this term for the discussion held in this paper. However, we are aware that in some cases the term 'originator' could be fitting. For a discussion on originals and originators, see Quenzer et al. 2023.

⁷ These factors are presented and discussed below in Section 2.

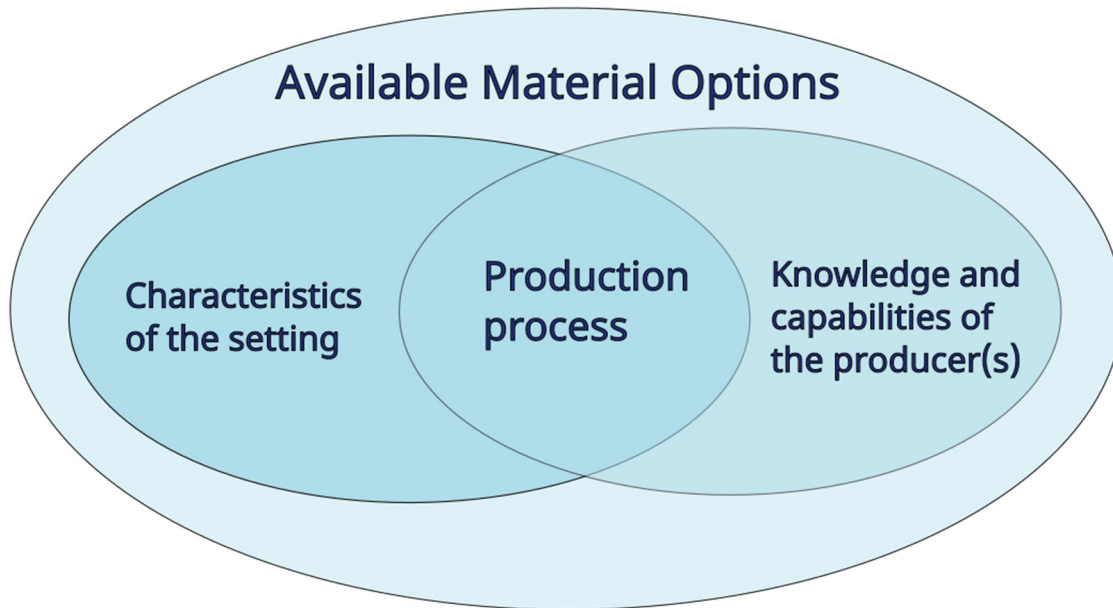


Fig. 1. Venn diagram conceptualising the material options available in the production process.

still implies the act of choosing a material, as they can always opt not to write. Singular material choices introduce contiguous and interdependent elements within one WA (e.g. paper, ruling, ink). Thus, material choices are part of an interlinked chain of a producer's decisions that can be path dependent.⁸

The sections that follow have been conceived as components of the proposed pathway to investigate material choices in WAs. Section 1 (Material choices manifested) summarises essential steps in the process of investigating the material dimensions of WAs. Section 2 (Factors driving material choices) is devoted to identifying the main factors that influence material choices. Section 3 (Path dependence in the production of WAs) discusses how material choices interrelate and affect one another in a WA. More specifically, Section 1 provides the basis for the research on material choices, Section 2 summarises the discussion held in RFK, based on case studies from different cultures and periods, and Section 3 provides concrete examples of path-dependent material choices, a phenomenon that requires further investigation.

This paper is intended as a preliminary tool providing a starting point for future work. We expect that further research, especially focused on coherent groups of WAs, will refine our results, expanding on the initial framework offered here.

⁸ We expand on this concept below in Section 3.

1. Material choices manifested

Material choices of WAs⁹ are manifested in many ways, including:

- **Form:** whether it is a codex, a scroll, a tablet, a pothi, a stela, etc.
- **Dimensions and format:** shape, proportion, size, weight, folding patterns, etc.¹⁰
- **Writing support:** the material used as a writing surface (e.g., paper, parchment, palm-leaf, rock, glass, bronze)
- **Preparation of the writing support:** ruling (instrument used), sizing and other surface treatments and possible additional substances such as dyes, perfumes, etc.
- **Writing techniques and tools:** incising with a stylus, applying ink with a quill or painting with a spray can, etc.
- **Writing substances:** inks, pigments, binders, varnishes, etc. and their technological features, and elemental and chemical composition
- **Binding or protective elements:** bindings, covers, envelopes, cases, clips, poisonous substances, etc.
- **Visual organisation of the content:** the ‘disposition of the signs’ on a writing surface, including features such as the linear arrangement of the writing, reading direction, written area, style of script, decoration, etc.¹¹

These factors all influence the initial production of WAs, yet WAs are not fixed entities but instead evolve over time. WAs containing sets of changes undertaken intentionally by humans (e.g. the creation of a new binding or the insertion of a note of ownership) are said to be multilayered and are shaped after more than one production process.¹² In investigating the material dimension of WAs, the materials employed in the initial and subsequent production processes, that is, the stratigraphy of the WA, need to be correctly acknowledged and distinguished.¹³

⁹ We do not claim to be exhaustive with the listed material features as they can significantly differ depending on the type of WAs and disciplines involved. An example of a more detailed list of features for the manuscript form ‘scroll’ is offered in Andrist et al. 2023.

¹⁰ We recommend a strict distinction between the terms form, format and size. While form refers to book forms and other types of written artefacts, size refers to the dimensions of the object, and format can be understood, following Paul Needham, as ‘a technical codicological concept [of codices]: how the original unit of writing support was folded and cut to produce quires’. Cf. Needham 1994: 128.

¹¹ See Wimmer 2023 for a complete discussion of visual organisation patterns.

¹² Maksimczuk et al. 2024, 3: ‘A layer is the result of an act of production that creates or transforms a WA. We refer to the former type of layer as primary layer and to the latter as secondary layer. WAs with at least two distinct layers (i.e. a primary layer plus secondary layer[s]) are multilayered. All layers and the operations through which they may be created are intentional.’

¹³ For the stratigraphic approach in the study of WAs, see Derolez 1974, Gumbert 2004, Andrist 2015, Maksimczuk et al. 2024.

Certain material choices in WAs are detectable only through the combination of methodologies from the humanities (palaeography, codicology, art history, etc.) and material sciences (archaeometry, analytical chemistry, physics, mineralogy, biology, etc.). This interdisciplinary approach has been implemented by scholars of the CSMC for more than a decade. It affords an understanding of the physical and chemical composition of the materials and their production processes, thereby revealing important information about the WAs that would otherwise have remained unnoticed to the naked eye.¹⁴

2. Factors driving material choices

The material features of a WA are contingent; they result from a process of selection in which producers choose certain material options instead of others (or instead of not writing). In the act of writing, the content, context of production, and material dimensions of the WA are strictly interrelated, and can mutually influence one another. Moreover, before the writing takes place, the material options from which the producers can select are initially shaped by the interaction of two different elements: the setting in which the WA is created, and the capabilities of its producers.

WAs are human-made objects and their creation, use and further processing (i.e. the addition of secondary layers) are a chain of interlinked events in the WA's biography. Contextualising these events is of paramount relevance for the interpretation of the meaning and cultural implications of the material features of a WA. Each event in a WA's life takes place in a specific setting, namely, in a given period of time and location, and within a specific community.¹⁵ Settings of creation, use, and layering can be reconstructed on the basis of the dating, origin and provenance of the WA and/or its layers, as well as their producers' and users' connections to a specific socio-cultural background, education, technological knowledge, linguistic competences, religious beliefs, economic resources, political associations, etc. The opposite also holds true; settings of creation, use, and layering can likewise be used to help to infer the date, origin, and provenance of a WA.¹⁶ The settings of production and use are characterised by a set of

¹⁴ For instance, archaeometrical methods contribute to answering the questions grouped within A.2 in the list of guiding questions mentioned in Footnote 2. A complete overview of how the methodologies of material sciences can be applied to the study of WAs, including relevant study cases, is offered in the CSMC Guide to Written Artefact Profiling (Colini et al. 2024), developed by RFA and RFK.

¹⁵ Cf. Note 6.

¹⁶ See CSMC Guide to Written Artefact Profiling (Colini et al. 2024), in particular entries 'How to date my written artefact?' <https://www.csmc.uni-hamburg.de/profiling-guide/research-questions/q06.html> and 'Where does my written artefact come from?' <https://www.csmc.uni-hamburg.de/profiling-guide/research-questions/q03.html>

patterns, that is, particular conventions that “structure and guide the production as well as the use of a manuscript, enabling, facilitating, encouraging or impeding specific kinds of production and use.”¹⁷ The patterns peculiar to a given setting can be identified through a comparative analysis of numerous WAs produced in the relevant setting in terms of material and content-related features.

Producers’ material choices are straightforwardly manifested in the WAs they created (see Section 1 above). In the following we discuss a first set of factors that guide producers in making their material choices. These factors are linked to two different aspects of the production of a WA: first, factors that are predominantly determined by the economic, spatial and cultural circumstances, that is, the specific setting of the production, including ‘Resources’, ‘Spatiality’, and ‘Norms and conventions’; and second, the intended affordances of a WA¹⁸, that is, the actions or effects for which it can be used. The affordances of WAs are not limited to reading. Letters and notebooks, for example, must be easily portable, and some magical and healing written artefacts are designed to be edible (e.g. inscribed wafers or apples) or written with inks that can be washed and drunk.¹⁹ The list of affordances, especially of those WAs whose main function is not to convey content, is potentially limitless (e.g. writing on weapons, musical instruments, tableware, coins, etc.), but the affordance-related factors ‘Accessibility of content’, ‘Mobility’ and ‘Durability’ seem particularly relevant to the choice of materials.

For the sake of clarity, the factors that we discuss below are presented and analysed as separate subsections. In practice, however, they are intrinsically interrelated and often several of them play an equally important role in the selection of certain materials. A student in the Western-European Middle Ages, for instance, who took notes during lessons at a university or school, would choose a specific type of writing support that was easy to transport, to acquire, and eventually to store or dispose of. The preferred writing support in such circumstances was small strips of parchment (*schedulae*), the unused remnants in the production of expensive parchment sheets. Their low price made these small strips of parchment a perfect medium for ephemeral notes, and their small size and light weight made them easily transportable from the school or university to the student’s residence.²⁰ Thus, factors such as ‘Resources’, ‘Mobility’ and ‘Durability’ appear to have been at play in the case of the selection of a specific writing support for the

¹⁷ Wimmer et al. 2015: 7.

¹⁸ On the concept of affordance see Gibson 1979: 119–137; Scarantino 2003. On affordance in manuscript studies see Fox, Panagiotopoulos and Tsouparopoulou 2015.

¹⁹ See Suit 2020.

²⁰ Kwakkel 2012. The use of discarded parchment is a widespread phenomenon. Letters, receipts, contracts, oracle tickets and texts of applied magic made from scraps of parchment are, for example, occasionally attested in Late Antique Egypt. See De Nie 1942: 615–618; De Bruyn 2017: 43–44; Delattre 2017.

notes. The same dynamic interplay of factors might be observable in several other WAs among the examples below.

2.1 Resources

The resources (materials, time, money, workforce, etc.) available to the producers at the moment of production account largely for their choices. The availability of resources may vary according to the general economic and political circumstances of the society in which the producers act and/or on the particular socio-economic or biographical circumstances of the producers themselves. The utilisation of non-standard writing materials and the reuse of materials can, for example, be indicators for resource-related material choices.²¹

It has often been observed that producers may choose materials that are easier for them to acquire, even if this implies a deviation from the standard material in use for the type of WA they intend to create. In Arabic treatises for ink making, several recipes describe methods to obtain golden inks using surrogate materials, such as orpiment and saffron, instead of the more expensive gold.²² Another example of deviation from standard material is the Arabic marriage contract written in al-Bahnasa, Egypt, in 1207 on linen and preserved in SUB, P.Hamb.Arab.1.²³ For this manuscript, cloth was selected as the writing support, most likely because scraps of textile could easily be acquired by the bride's father, a cloth merchant, for a fairer price than the standard writing supports for marriage contracts of that period: parchment or high-quality paper (Fig. 2).

In cultures in which parchment served as a writing support, previously used parchment was often washed and reused as a new writing support (*palimpsest*).²⁴ This practice was often adopted to reduce costs, as hides from hundreds of animals were needed to obtain enough parchment leaves for a codex, making it a very expensive material. The example of a small codex of Christian Arabic homilies produced at Saint Catherine's Monastery on Mount Sinai in the ninth or tenth century (Cambridge, University Library, Or.1287)²⁵ demonstrates that in this particular setting it was common practice to reuse parchment

²¹ Reuse of material can have reasons other than the availability of resources. See the example of the Sutra letters below in Section 2.3.

²² Raggetti 2024.

²³ Colini and Livingston 2021; Dietrich 1952.

²⁴ An overview of palimpsests and related phenomena across cultures is provided in Gippert, Maksimczuk and Sargsyan, 2025.

²⁵ Digital images of this manuscript are available at <https://cudl.lib.cam.ac.uk/view/MS-OR-01287/1> (last access 28 November 2024).

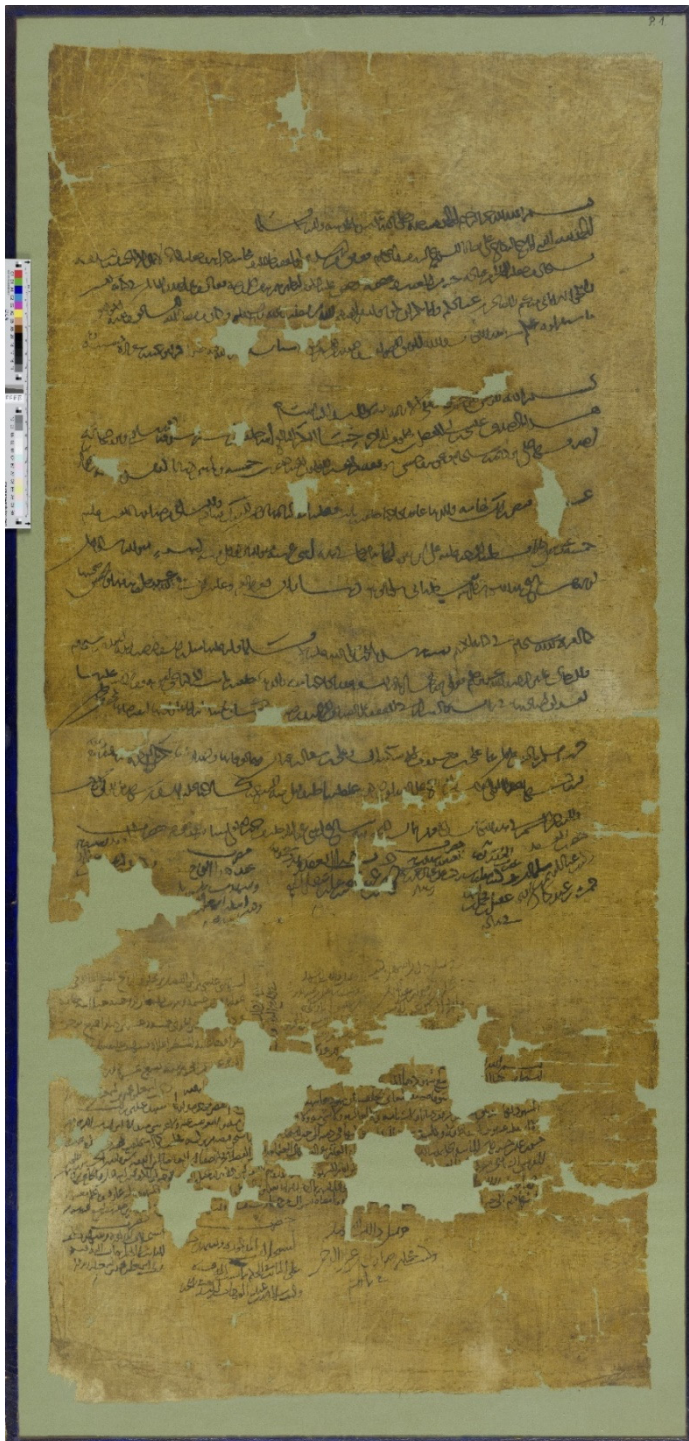


Fig. 2. Manuscript on linen. Hamburg, State and University Library, P.Hamb.Arab.1.

leaves from different manuscripts for assembling a new artefact. The format and dimensions of the primary manuscripts were adapted to align with the new shape, size, and folding patterns of the secondary manuscript. The monk producing this booklet re-used parchment from manuscripts containing texts in Syriac, Greek, Armenian and Arabic, respectively. Among them, there are leaves from a small and a large Qur'anic manuscript, which were rotated 90 degrees and folded to create bifolia for the small codex

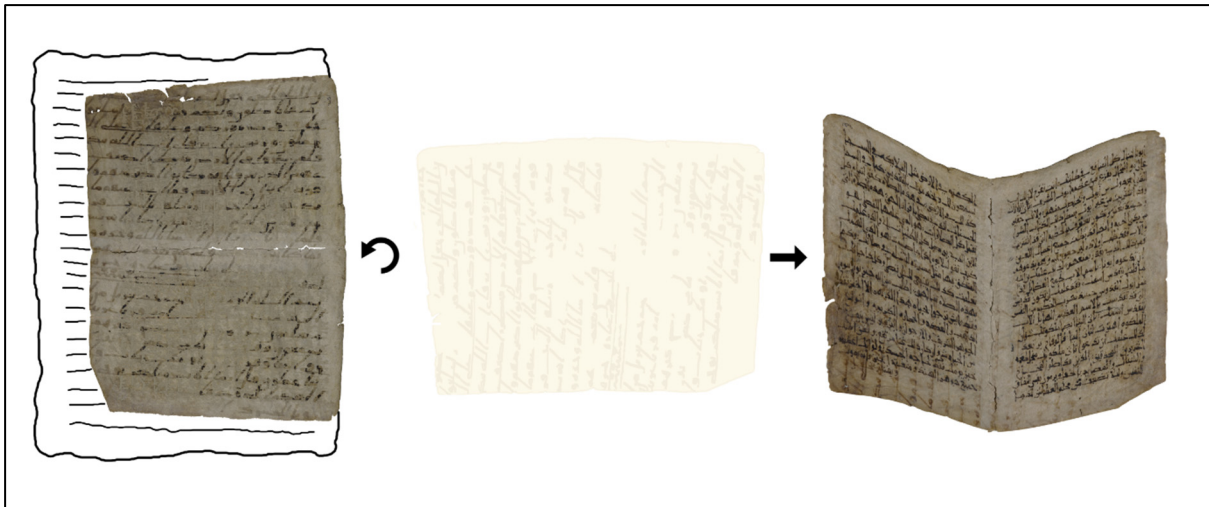


Fig. 3. Reuse of a parchment leaf adjusted to the format of the new codex
Cambridge, Cambridge University Library, Or.1287

Palimpsest leaf. Qur'an fragment (Q.40:78-41:9) from the 7th–8th century (*scriptio inferior*) and Christian homily on the Lord's Prayer from the 9th–10th century (*scriptio superior*).

of homilies. The larger leaves were trimmed to reduce their dimensions (see Fig. 3).²⁶ In this case, the Qur'anic text was recovered using ultraviolet (UV) and infrared (IR) photography, but multispectral imaging (MSI) proved to be much more effective for the recovery of the *scriptio inferior*, and is now being used on several manuscripts from the same Monastery showing similar patterns of reuse.²⁷

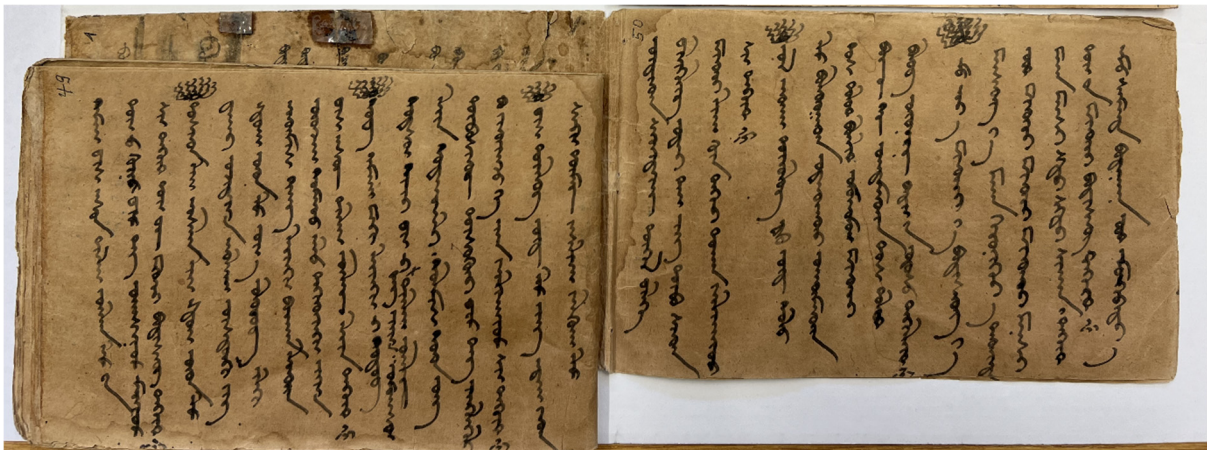
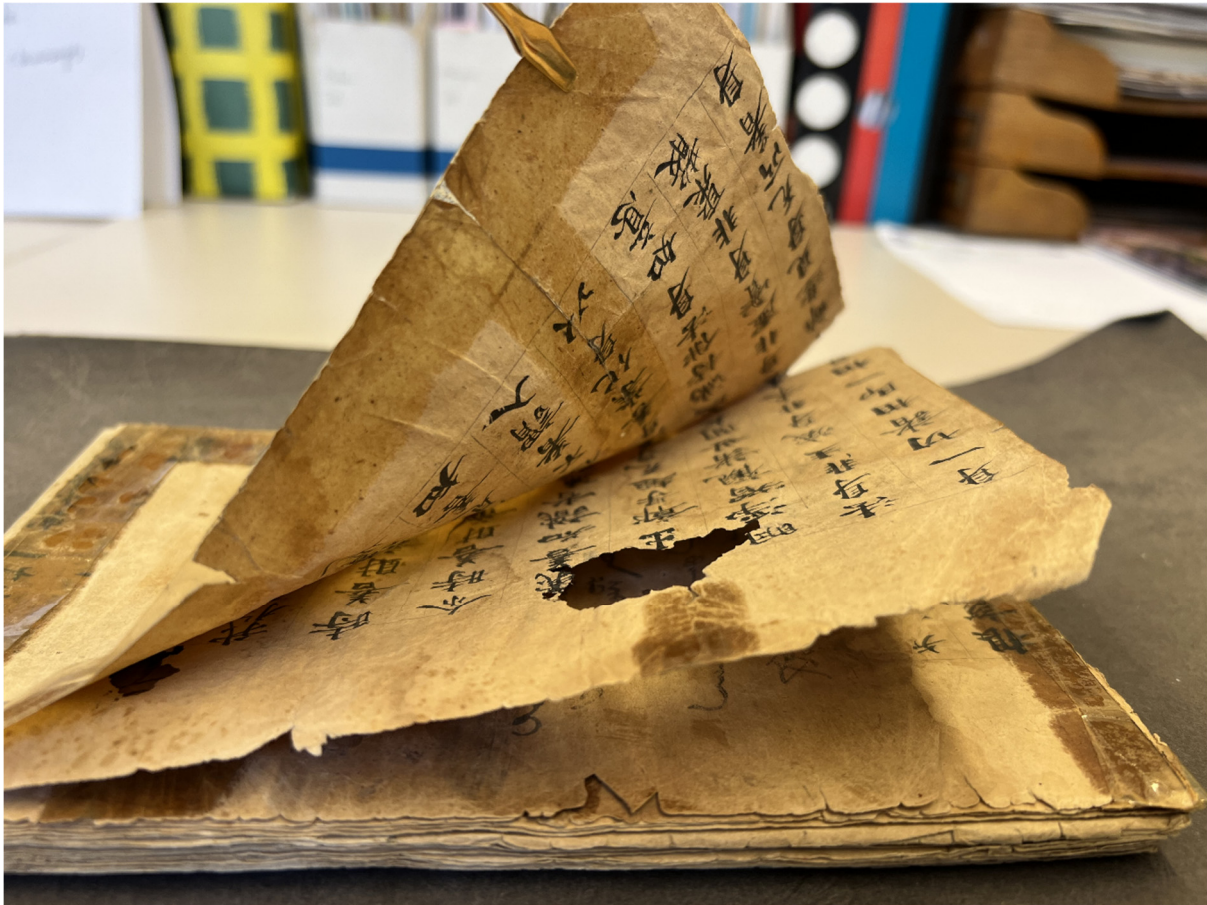
In the case of the Old Uyghur manuscript culture, while manuscripts were usually prepared from paper made of fresh fibres (mulberry) or rag (ramie, hemp, flax, cotton), or a combination of both,²⁸ producers regularly employed the blank backs of Chinese paper manuscripts for their writings.²⁹ The manuscript Ch/U 7570 in the Berlin Turfan Collection is an example of this practice. This stitched book (13 × 20 cm) was produced by an anonymous Uyghur scribe in the thirteenth or fourteenth century, reusing eighteen segments from a Chinese scroll containing the Buddhist text *Da fangguang Fo Huayan jing* 大方廣佛華嚴經 (*Avataṃsakasūtra*) (Fig. 4–5). The scroll segments were prepared by folding each of them horizontally. Several of these folded sheets were combined into quires, folded again and joined together by stitching at the fold. The so-called **Insadi* booklet consists of three quires. The first two were wrapped in another folded Chinese

²⁶ Fedeli 2023.

²⁷ The reconstructed pages of the Qur'anic manuscripts can be found on the website of Cambridge University Library (cudl.lib.cam.ac.uk/collections/minganalewis/1, last access 28 September 2024); examples of manuscripts of the Saint Catherine's Monastery that have been imaged within the Sinai Palimpsest Project (sinaied.library.ucla.edu/, last access 28 September 2024) can be found in Rapp et al. (eds) 2023.

²⁸ Rischel 2012: 265–311.

²⁹ Raschmann 2014: 531–535.



Figs. 4–5. Details of *Depositum der Berlin-Brandenburgischen Akademie der Wissenschaften in der Staatsbibliothek zu Berlin – Preußischer Kulturbesitz, Ch/U 7570*. In this manuscript, segments from a Chinese scroll were reused by a Uyghur scribe.

scroll fragment. As a result, each page of the newly created book has Chinese text on the inside, which is now almost invisible, except in the case of damage to the manuscript.

2.2 Spatiality

By spatiality we refer to different space-related circumstances in which a WA is produced and/or used. Some such circumstances relevant to the discussion of material choices are: 1) posture of the producer and user (sitting, standing, lying, walking, etc.); 2) physical distance between the WA and the user; 3) physical interaction between the writing support or the WA and functional objects during the processes of production and/or use (e.g. body parts, clothing, table, floor, wall, lectern, etc.); and 4) the environmental characteristics of the location where a WA is produced, used, or stored.

The standard size and format of restaurant order notes facilitates writing while standing. They are usually written on small slips of paper that can fit on the palm of a hand. Thus, writers can hold the slip of paper (or a block with many of them) on the palm of the non-dominant hand while writing down the orders (Fig. 6).³⁰

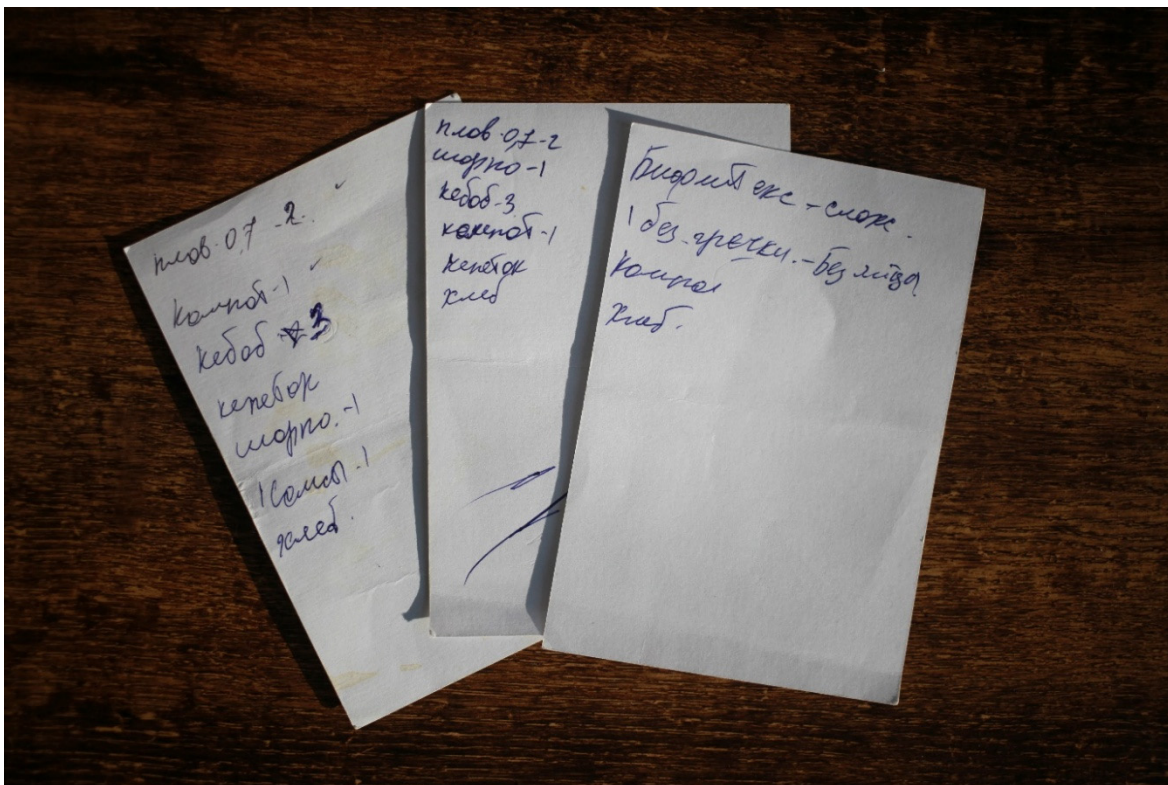


Fig. 6. Set of restaurant order notes (12.3 × 8.5 cm). Provenience: Kant, Kyrgyzstan, 2022; content in Russian language

WAs created to be legible from a distance (e.g. signs, inscriptions, graffiti) require special features in their visual organisation and the choice of materials. A most typical material

³⁰ Restaurant order notes are good examples of how different factors can be at play in the selection of materials: in addition to facilitating writing while standing, small slips of paper are also easier to carry and to pass to other people (e.g. those working in the kitchen). See our thoughts on the concept of 'Mobility' below, in Section 2.5.

choice for such WAs would be the adoption of large signs and contrasting colours between the content and the writing support. For example, Fig. 7 shows an image from a building in Taipei City (Taiwan) where, aside from advertisement banners, there are three large graffiti in Latin script and one in Chinese, which can be seen and read from the opposite street.

Despite their considerable weight, Ethiopian Christian codices show the absence of sewing and spine supports in their bindings, reflected in the practice of reading while keeping the book open on one's knees, or in the use of traditional book cradles during worship ceremonies.³¹ This is still witnessed nowadays: during celebrations, manuscripts are put on cradles made of wood, metal or rock and covered by rugs for the purpose of keeping the books open during readings or to display specific texts and illuminations (Fig. 8). In this case, the characteristics of the book structure and the continuity of the bookbinding technique also reflect the wish of the Ethiopic Christian tradition to differ from the coexisting Islamic one in the Horn of Africa.³²

2.3 Rules, norms and conventions

As noted, WAs are created in settings with particular conventional patterns which strongly influence the selection of materials. This can be observed particularly clearly in the case of culturally and religiously important contents and WAs, in aesthetic value judgements, and where two different cultures meet and react to each other's conventions and patterns.

Of particular importance for research into the influence of norms and conventional patterns on the choice of materials are explicitly expressed rules, for example not only in legal texts but also in instructional texts for the production of WAs. A famous example for the (possible) influence of administrative rules on the choice of writing materials are the regulations of paper use by Frederick II (1194–1250 CE), King of Sicily and Holy Roman Emperor, who was reacting to the gradual replacement of parchment by paper as the standard writing support for documents.³³ In a document concerning the installation of a public notary, issued by Frederick II between 1220 and 1225, he prohibited the notary

³¹ On Ethiopic bookbinding see Dal Sasso 2023: 267; on the codicological description of Ethiopian liturgical codices, see Balicka-Witakowska et al. 2015: 154–174.

³² Dal Sasso 2023: 255.

³³ This transition, which began in the 11th century, was preceded by the transition from papyrus to parchment as a writing support for documents. It began in the Frankish Kingdom as early as the 7th century, but was not implemented in Naples until the 10th to 11th centuries. On the latter, see the exemplary study by Internullo 2023. Comparable works on the beginning of the use of paper for documents are lacking.



Fig. 7. Banners and graffiti (in different scripts), visible from a distance. Taipei City



Fig. 8. Liturgical book displayed on a book cradle by an Ethiopian orthodox priest. The unsupported sewing structure of the manuscript allows it to be opened at a wide angle. Lalibela, Monastery of Na'akk'weto La'ab.

from issuing public deeds on reused scraped parchment or paper.³⁴ Frederick explained the reasons for this regulation in 1231 in the *Constitutions of Melfi*, in which he prescribed for the entire Kingdom of Sicily that public deeds could be written only on parchment.³⁵ The king feared that these documents, which were to be kept for a very long time, would otherwise be destroyed too quickly. Paper documents therefore had to be rewritten on parchment in Naples, Amalfi and Sorrento within the following two years in order to preserve their validity. However, as a surviving document on paper, written in the chancery of Frederick II himself in 1228, proves, paper was indeed used to record other less durable legal acts.³⁶

Content made for or during the performance of religious, magical or medical ceremonies are often regulated by norm or convention encoded in WAs featuring special material characteristics, to which symbolic properties pertaining to the relevant performance are attributed.³⁷ Torah manuscripts, for example, are considered to be holy artefacts and must be written according to strict rules. They must take the form of a scroll, be written

³⁴ *Die Urkunden Friedrichs II.*, Teil 6: 1226–1231 2021, I: 639–640 (No. 1145a).

³⁵ *Die Konstitutionen Friedrichs II. für das Königreich Sizilien* 1996, 253–254 (No. I 80), https://www.dmgh.de/mgh_const_2_suppl/#page/253/ (last access on 12/12/2024).

³⁶ *Die Urkunden Friedrichs II.*, Teil 6, 235 (No. D 1284).

³⁷ For such manuscripts, see Brita et al. 2024: 10–11.

by a *sofer stam* (a scribe who is qualified to write Torah scrolls, Tefillin and Mezuzot), and made of parchment or leather sheets taken from kosher animals.³⁸ In mediaeval Japan, letter sutras took the form of scrolls produced in Buddhist death rituals of mourning. As a writing support, the producer used papers bearing the script of the deceased on the recto, most often their autograph letters, while the verso was blank. Several pieces of paper were combined to create a scroll and, after adequately preparing the verso side of the letters, they wrote a Buddhist scripture (preferably, the Lotus Sutra).³⁹

Aesthetic value judgements and rules guide the visual appearance and perception of WAs and their materials. Certain materials are preferred by one (manuscript) culture and dismissed by another, even though they are accessible by both, simply because the materials are perceived and valued differently in each of those cultures. Such perceptions might have a diachronic evolution within the same geographic area and stem from several factors, such as a particular set of values, beliefs, and aesthetic and cultural conventions. An example can be found within the Dēwāshtīch archive, showing the correspondence between Umayyad rulers and Sogdian local elite in the early eighth century CE. The choice of the local ruler Dēwāshtīch to write a formal petition to the Umayyad in Arabic and on parchment, while all of his other letters were written on paper, shows that the Sogdians thought the most appreciated, formal and precious writing support for the Arabs was parchment. On the other hand, correspondence by Arabs in Sogdiana for the Sogdians was written on paper, suggesting that the Arabs were also trying to please their addressee by using their preferred material choice.⁴⁰

Aesthetic decisions are not only aimed at beauty and appreciation, but also at an aesthetic match between the sign and the referent, for example the WA and its owner or addressee. Liturgical manuscripts were created for the service of God and were therefore often extravagantly beautiful and richly decorated. The splendour of these manuscripts corresponded not only to the importance of their donor and the church owning them, but also to the splendour of God and his creation. A classic example of this is the so-called *Codex Purpureus Rossanensis* (traditionally dated to the sixth century CE), a luxurious WA containing the Greek Gospels written with gold and silver ink on purple-dyed parchment and decorated with lavish miniatures.⁴¹ Similar cases involving the use of deep-blue dyed parchment with gold and silver scripts are those of the renowned Blue Qur'an and of the Cava Bible, which still raise some questions related to their production

³⁸ Stern 2017: 11–61. By contrast, in the 10th and 11th century, the Karaites, a Jewish movement that rejected the legal authority of oral law, used the codex form for the Bible and other material features from the early Qur'ans to reinforce their identity. Cf. Khan 2020.

³⁹ O'Neal 2019.

⁴⁰ Rustow 2020: 124–130.

⁴¹ Cavallo 1992; for the analyses of the writing materials see Bicchieri, 2020.

contexts and manufacturing techniques.⁴² The relation between aesthetics and significance can also be observed in the case of personal WAs, like the Mesopotamian cylinder seals. These are centimetre-sized barrel-shaped objects that were engraved in reverse (*intaglio*) depicting characteristic daily-life scenes, and mythological and divine encounters. They were often drilled vertically so that a string or wire could pass through the hole and be worn around the wrist or neck. For the production of cylinder seals throughout the different periods of Mesopotamian history, different minerals and rocks (identifiable with Raman spectroscopy,⁴³ Fig. 9) were used as writing supports. In addition to practical production-related factors, the choice of materials was influenced by the specific values, and sometimes magical meanings, assigned to certain rocks and minerals. For instance, lapis lazuli, beside its high purchase price that automatically placed it high in the hierarchy of a community, was believed to be a sign of masculine power and divine favour, whereas hematite, predominantly used in the first half of the second millennium BCE, was connected to justice and to an intrinsic power associated with the Sun God, due to its metallic lustre.⁴⁴ By choosing the material for this personalised WA, the wearer was able to communicate a message about themselves.

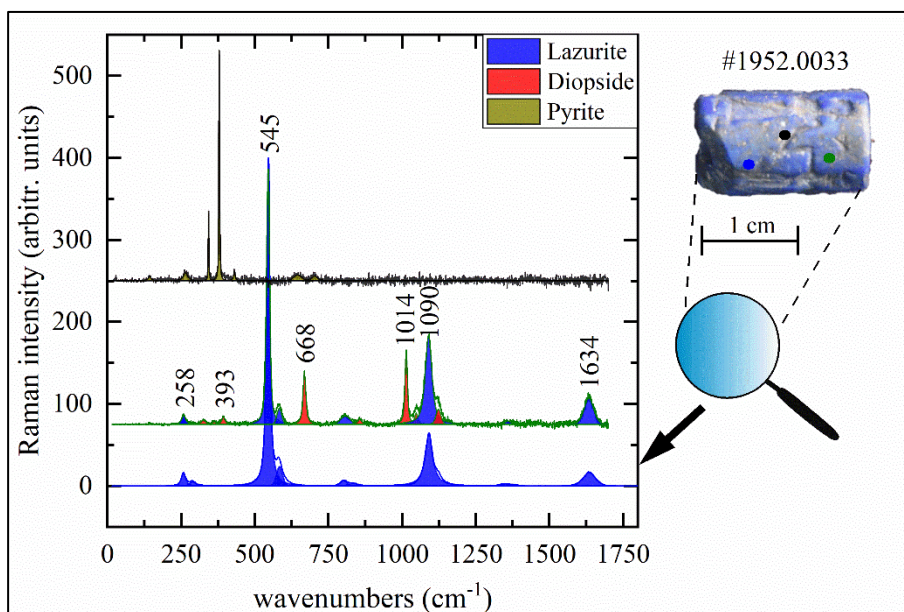


Fig. 9. Raman spectra of a cylinder seal, the writing support of which is composed of lazurite (the most abundant mineral species in lapis lazuli). The Raman spectral profile of lazurite and the presence of pyrite and diopside as accessory minerals are indicative of lapis lazuli from Afghanistan. Hamburg, Museum für Kunst und Gewerbe, catalogue number #1952.0033.⁴⁵

⁴² See George 2008; D’Ottone Rambach 2017; Porter 2018.

⁴³ See Aspiotis et al. 2023.

⁴⁴ See Collon 2005; Simkó 2014.

⁴⁵ Image adapted by Stylianos Aspiotis from Aspiotis et al. 2024. See also this publication for a fuller discussion on the subject.

2.4 Accessibility of content

The most self-evident function of a WA is to convey content and make it accessible to certain readership. Material choices regarding legibility and readability are guided by the consideration of principles such as: the expected physical distance between the readers and the WA (cf. our thoughts about spatiality above, in Section 2.2), facilitating the navigation of the WA (especially useful in multiple-text manuscripts⁴⁶ and WAs transmitting extensive items of content); and the particular characteristics of the expected readership (whether it is the writer, their close circle, a broad and heterogeneous public, or divinities; aged or young people; educated or uneducated people, etc.). Material features which facilitate the navigation of the WA provide guidance through the content and enable searching and cross-referencing, for example by means of coloured chapter or page titles, ribbon bookmarks or page markers (Fig. 10).



Fig. 10. Fore-edge of a Missal Codex with leather page markers to facilitate the navigation of the WA. Hamburg, State and University Library of Hamburg, Cod. cath. 5.

If the producer expects a high degree of readability for a wide audience, they will choose a type of visual organisation that allows readers to clearly see the content. In the case of a mediaeval Greek codex, this consists of well-shaped letters, generous spacing between words, lines and columns, avoiding the use of ligatures and compendia, and so on. On the other hand, WAs produced for personal use and expected to be read by their own writer are usually characterised by the selection of a very different type of visual organisation and choice of materials. According to Durand-Guédy and Paul 2023, such manuscripts have the following features: ‘margins are not kept well; the writing sometimes

⁴⁶ For multiple-text manuscripts (MTMs), see Friedrich and Schwarke 2016; Bausi, Friedrich and Maniaci 2019; Brita and Karolewski 2021.

comes so close to the edges of the writing support that there are hardly any margins left. [...] There is less use of colours, and decoration is generally either absent altogether or much less prominent than in books made on commission. Inks and papers can vary as can formats, and we sometimes see a reuse of the writing support, such as scrap paper, parchment or clay. The handwriting can be very idiosyncratic [...]'.⁴⁷

2.5 Mobility

WAs may be designed both as fixed inscriptions for a specific location, and as transportable objects. Stationary WAs such as inscribed buildings (see above Fig. 7) or statues (see below, Fig. 13) cannot be moved or can be moved only with considerable effort, while transportable WAs such as coins or letters can easily be carried and disseminated. While the accessibility of fixed written artefacts depends on the natural or artificial conditions of the space and the social control over it, the transmission of transportable WAs depends both on the intentions of the object owners and on the material features of the object itself, that is, its dimensions, weight, resilience, etc.

An example of an easily transportable WA is the pendant Qur'an.⁴⁸ This particular type of codex was produced in the Middle East between the fourteenth and nineteenth centuries CE. The Qur'ans were shaped as an octagonal prism, with their pages typically measuring three to eight centimetres in height and width, which made their size extraordinarily small compared to other Qur'an codices (Fig. 11). The rationale behind choosing this rather peculiar format was the aim of making pendant Qur'an manuscripts easily transportable, as it facilitated holding and carrying the object on the body like an amulet, or attaching it to the finials of military flag poles and other symbolically charged objects.



Fig. 11. Example of an easily transportable WA, an octagonal pendant Qur'an (5.2 × 5.5 × 2.3 cm) with 272 folios; probably Iran, seventeenth century CE. Staatsbibliothek zu Berlin – Preußischer Kulturbesitz (SBB), Hs. or. 13944.

⁴⁷ Durand-Guédy and Paul 2023: 4.

⁴⁸ Berthold 2021.

2.6 Durability

Some WAs are created with the expectation of lasting forever, whereas others are meant to last only a short period of time. The expected life cycle of a WA is related to its content and the effort and cost that its production requires. Accordingly, it is not surprising that criteria such as ephemerality and longevity guide the selection of certain materials over others.

Short and ad hoc content such as that in so-called ‘to-do notes’ are not made for transmission. For such ephemeral WAs, producers generally choose writing supports that might be at hand (at their desk, in their pocket, etc.), are cheap (often reusing writing supports), and require little or no preparation before writing on them (such as polishing the writing surface). For example, shopping lists are usually written on modest writing supports and are disposed of after use.⁴⁹

By contrast, the quest for the longevity of a WA guides choices towards specific prophylactic features such as durability of writing support, bindings and accompanying protective elements. As in the case of most codex cultures in which parchment was used as a writing support, the Ethiopian culture favoured wooden boards to protect the book block. The wood for the boards was traditionally obtained from *wanza* (*Cordia Africana*), cedar or *wäyra* (*Olea Africana*). These two species were generally chosen for their hardness and for being less attractive to insects. These features were particularly useful when the manuscripts had to be buried underground or hidden in caves to protect them and the owners during times of religious persecution. Moreover, at least from the sixteenth century CE, a further protective element accompanied Ethiopian codices: a satchel prepared from animal hide (*maḥdär*) was commonly used to protect or transport the manuscripts (Fig. 12).⁵⁰

No material in itself, however, guarantees the durability of a WA; inscriptions on mountains or on monuments can be erased or destroyed by weather phenomena or human action alike, together with the object hosting it. Other factors such as cultural relevance (e.g. the sketch book of a famous artist) or sentimental reasons (the letters of a lover) are paramount for the preservation. For instance, the so-called *Memnon Colossus*, located at the entrance of the mortuary complex of the eighteenth dynasty pharaoh Amenhotep III (1386–1353 BCE), together with another identical statue, in what is today

⁴⁹ A collection of shopping lists is available in Boning 2013.

⁵⁰ Sergew Hable Selassie 1981: 24–26. For an exhaustive description of *maḥdär* production see Hanscom 2016: 300–355.



Fig. 12. Example of a Traditional book satchel, sixteenth century CE. Hamburg, State and University Library, Cod. Orient. 405.

the modern city of Luxor (ancient Thebes) in southern Egypt, is an exemplificative case of a long-lasting WA preserved because of both its material dimension and its cultural and religious impact over millennia. The hieroglyphic inscriptions carved on this colossal statue made of a single block of quartzite sandstone identify the monument as a depiction of the New Kingdom god-king venerated in this sanctuary. While anthropic and natural events have led to the disappearance of the mortuary temple of Amenhotep III, this

colossal statue weighing 720 tons still stands today (Fig. 13). After being damaged by an earthquake in 27 or 26 BCE, the statue began to produce a sound when heated by the sun's rays, believed to be the voice of the Homeric hero Memnon. Secondary layers of Greek and Latin graffiti scribbled on the leg of the Colossus testify to the transformation of this statue into a memorial of Memnon, adding cultural relevance as an additional reason for its preservation.



Fig. 13. Example of a long-lasting WA, Luxor, The two Colossi of the temple of Amenhotep III.

3. Path dependence in the production of WAs

The decision-making process for the production of WAs can be described as path-dependent. Material choices made in the beginning influence later choices and reduce the number of possible options. This is so because no material is isolated in a WA; all the materials are intertwined with and interdependent on others. Thus, properties of certain materials will determine the selection of others, with which they will interact in the same artefact. A case in point is the pendant Qur'ans.⁵¹ While sharing several material features with the Qur'an manuscripts of larger size (e.g. leather for the binding, inks and colours for the text and illumination), the small ones call for special solutions in terms

⁵¹ Cf. above Section 2.5.

of writing support and visual organisation. The paper in these manuscripts is notably thinner than that used in Qur'an codices of larger dimensions. This was to keep the codex sufficiently compact. Furthermore, the marginal space – which could make up two thirds of the entire page's surface in some higher-quality manuscripts of average size – was often reduced to a minimum to leave more room for the main text. Both script style and illumination were simplified as the artisans were probably not able to work with the same precision on this small scale.

A special case of path dependence is the 'secondary material choices', namely, material choices made by the producers of secondary layers.⁵² Producers of such layers have of course less freedom than those producing a primary layer, provided they want to adhere to the material features of the primary layer. This is particularly noticeable in the case of repairs and restoration. For instance, a scribe who has to restore a portion of text in a manuscript, due to a missing page or quire, would likely choose to use a writing support and a visual organisation similar to that of the primary layer.⁵³

This phenomenon can, for example, be observed in the German composite manuscript Cod. germ. 1 of the State and University Library Hamburg. This complex codex consists of two codicological production units. The first unit (fols 1–108) is a MTM, written around 1463 CE (subscription on fol. 98^v, in accordance with the watermarks) by several scribes from the Swabian language area on paper with nine different watermarks; the second unit is slightly older and was created in the same language area in 1454 CE (subscription on fol. 211^r, in accordance with the watermark) as a single text manuscript (STM) containing a didactic narrative cycle of the 'Seven Wise Masters'. The second part of the manuscript was predominantly written by one hand. According to palaeographic and ink analyses using X-ray fluorescence spectroscopy, only fols 109^{r-v}, 120^{r-v} and 205^{r-v} were written by another scribe. Since the two scribes agreed as to the visual organisation of the pages, it is not immediately evident how the fols 109, 120, and 205 relate to the rest of the codicological unit. Were they written by a cooperator of the main scribe or were they created by an independent scribe to restore missing parts in the unit? In other words, are they part of the *primary layer* or are they a *secondary layer* in the form of a restoration? The analysis of the quire structure and the paper stocks (watermarks) used by both scribes suggests that the fols 109, 120, and 205 come from an independent production process.⁵⁴ We can therefore conclude that the second unit was damaged, and

⁵² Cf. above, Note 13.

⁵³ When a material feature is not kept, this might be linked to the availability of resources (for example a parchment manuscript with an insert of paper) or the skills of the scribe or of the person making the repairs (i.e. the use of a different writing style).

⁵⁴ Interestingly, the watermark examination of the paper in fols 109, 120, and 205 indicates that they originate from a paper stock that was also used to produce the youngest codicological unit that was placed

the second scribe decided to repair it. He chose a paper format and visual organisation of the content similar to that of the primary layer (Fig. 14).

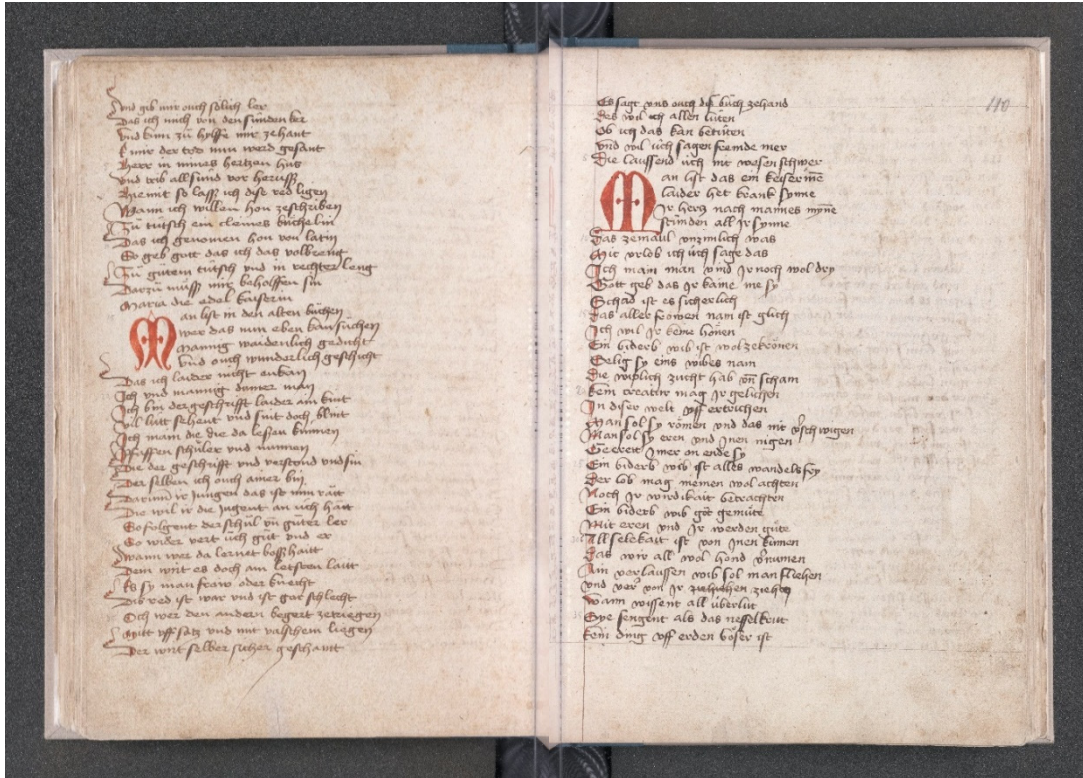


Fig. 14. Restored codex in which the producer of the secondary layer (the restoration) followed the material choices selected by the producer of the primary layer. Hamburg, State and University Library, Cod. germ 1, fols 109^v and 110^r.

In cases of paratactic composites, namely composites consisting of two or more independent codicological units,⁵⁵ the producer of the composite has rather limited material choices for the material features of the new book. Whereas they can choose the characteristics of the binding that will keep the units together, and the dimensions⁵⁶ of the new book they are creating, they cannot decide about other material features such as writing support and writing substance. An example of such limitation in terms of material choices can be observed in an Arabic composite manuscript from the first half of the 18th century CE preserved at the Staatsbibliothek zu Berlin (Pet 684). It contains an anthology of diverse texts, dating from the sixteenth to the eighteenth centuries, mostly in a fragmentary state, written on all sorts of papers: Arab and European with different

at the beginning of the Hamburg codex. Thus, it is most likely that the scribe who restored the second unit belonged to the same group of scribes who produced the first unit in the Hamburg codex. See Heiles, Rabin and Hahn 2018.

⁵⁵ Gumbert 2004.

⁵⁶ The producer of a composite can, for instance, choose to reduce the size of the folios in the relevant units.

watermarks, including recycled papers prepared for ledgers. In order to harmonise the dimensions of such different codicological units, the producer trimmed the margins of the biggest folios and, more remarkably, increased the size of the pages of smaller size (62 folios) by pasting strips of paper of similar colour in the margins, which were then filled with additional text (Fig. 15).

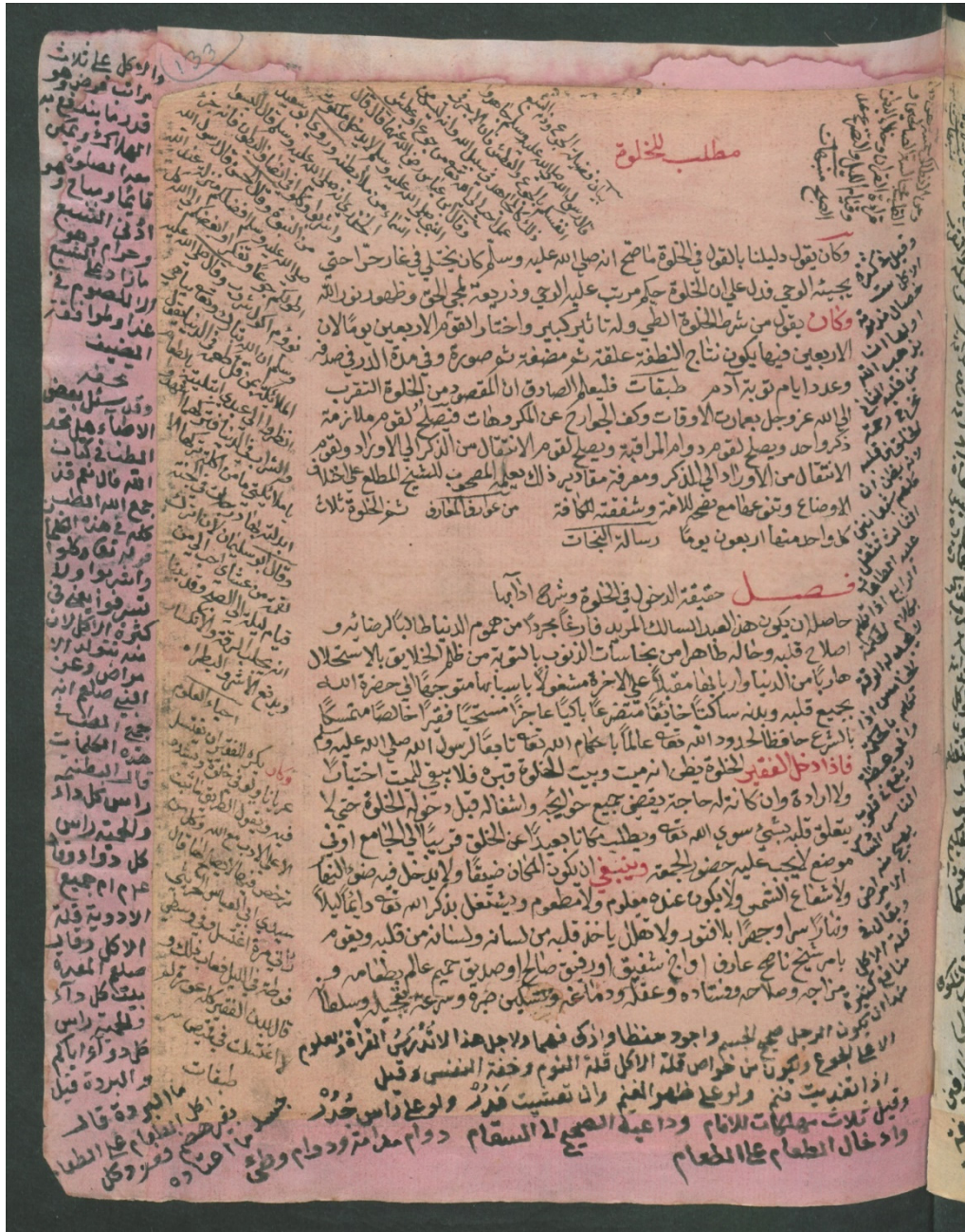


Fig. 15. Addition of paper strips to increase the size of the original page while creating a composite.

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