

## Article

# The Tibetan *Kanjur*: Regional Patterns and Preliminary Paper Typology of Manuscripts and Xylographs

Agnieszka Helman-Ważny | Hamburg

The consecutive editions<sup>1</sup> of the Tibetan *Kanjur*, i.e. the Buddhist canon in Tibetan script and language, were written or printed on paper. The paper preserved in these editions represents a variety of types and is a treasure of knowledge about the past. It may serve as an identification key and helps to obtain information about a book's origin, purpose, and significance in the further perspective. Complementary sets of data collected for each manuscript highly increase the possibilities of dating and determining the place of origin of unknown manuscript collections in the future.

For this study I examined paper in all available editions of the Tibetan *Kanjur* with respect to the dating and place of origin of a particular manuscript. These editions comprise:

- Printed in 1410 in Beijing: one folio of the *Yongle Kanjur* kept in the Special Collections Library, University of Michigan in Ann Arbor, USA;<sup>2</sup>
- Printed in 1606 in Beijing: the twenty-eight volumes of the *Wanli Kanjur* kept in the Jagiellonian University Library (Biblioteka Jagiellońska)<sup>3</sup> in Cracow, Poland;
- Printed in 1606 or slightly later in Beijing: the twenty-

two volumes of the Supplement to the *Wanli Kanjur* kept in the Jagiellonian University Library (Biblioteka Jagiellońska) in Cracow, Poland;

- Printed in 1606 or slightly later in Beijing: two volumes of the *Supplement* to the *Wanli Kanjur* kept in the Harvard-Yenching Library in Cambridge MA, USA;
- Handwritten in 1680 in Beijing: the *Berlin Kanjur* (manuscript Beck), which was copied from the *Wanli Kanjur* and is kept in the Berlin State Library – Prussian Cultural Heritage (Staatsbibliothek zu Berlin – Preußischer Kulturbesitz), Germany;
- Printed between 1684 and 1692 in Beijing: one volume from one of the later editions of the *Kangxi Kanjur* kept in the Jagiellonian University Library (Biblioteka Jagiellońska) in Cracow, Poland;
- Printed in 1730-1732 in Narthang: the *Narthang Kanjur* kept in the Berlin State Library – Prussian Cultural Heritage (Staatsbibliothek zu Berlin – Preußischer Kulturbesitz), Germany;
- Printed in 1733 in Derge: the *Derge Kanjur* kept in the Library of Congress, Washington D.C., USA;
- Printed in 1926 in Cone (blocks carved in 1721-1731): the *Cone Kanjur* kept in the Library of Congress, Washington D.C., USA;
- Printed in 1934 in Lhasa: the *Lhasa Kanjur* kept in the Berlin State Library – Prussian Cultural Heritage (Staatsbibliothek zu Berlin – Preußischer Kulturbesitz), Germany.

<sup>1</sup> The term 'edition' is not only used in the most common sense of a printed work, but also for the result of consciously produced handwritten or xylograph copies of the canon on the highest level of scholarship. The editorial work in Hellenistic Alexandria or of Byzantine scholarly circles is comparable in this context. In this sense I am using 'edition' for a set of volumes (number of prints) struck from one particular set of wooden blocks. I am additionally using the term 'set' where a particular collection of volumes was printed at the same time and represents the same physical features, such as page outline, type of paper and ink and the same style of decorations.

<sup>2</sup> According to the unpublished hand-list prepared in 1986 by Bruce Cameron Hall, 'Tibetan Manuscripts and Xylographs in Michigan Collections,' several items were received in 1924 from Edward Barrett, a New York fur trader who travelled in China in the 1920s, and as a side line sold 'Oriental curiosities,' mostly books and printing blocks. Among these is the single sheet identified by Hall as belonging to the *Yongle Kanjur*, catalogued as 'Central Asian Collection 1'. See Hall 1979, and Silk 1996, 171.

<sup>3</sup> All volumes mentioned that are kept in the Jagiellonian University Library belong to the Pander collection, which has recently been rediscovered in Cracow by the author of this article after having been considered lost in World War II. For more information see Eimer 2000, 27–51, and Helman-Ważny 2009.

These specimen of the Tibetan *Kanjur* are of different quantity, ranging from a small single folio to complete multi-volume sets. However, they provide a good representation of consecutive editions of the Tibetan *Kanjur* produced between the 15th and 20th centuries.<sup>4</sup> Particular sets were produced in different places, from Beijing in the East to the Lhasa region in the West. Varieties in paper type, the style of

<sup>4</sup> For more information on the history and development of the consecutive editions of the Tibetan *Kanjur*, see Eimer 1992.

particular volumes, and their format are closely connected to the different places where these books were produced. Documentation of paper features in known and datable sets of volumes allows for creating a solid chronological and regional reference for future work.

The earliest xylographic editions of the Tibetan *Kanjur* were printed in China. The first one was the edition identified by the reign name of its commissioner Emperor Yongle (r. 1402–1424), printed in red ink in 1410. In Beijing, new impressions continued to be taken from the *Yongle* blocks and in this way, the *Wanli* set printed in black ink in 1606 was produced.<sup>5</sup> When the blocks wore out, new blocks were prepared and carved, using prints of earlier blocks as a master. At present we cannot be sure about the total number of wooden blocks prepared for the so-called Beijing editions. Japanese scholars, who visited China during World War II, after their return provided the information that for printing the *Kanjur* in Beijing mainly two different sets of blocks were used. Here this second set of blocks is represented by one volume printed during the reign of emperor Kangxi (r. 1661–1722). However, the wooden blocks served for printing both the *Yongle* and *Wanli* sets of the Tibetan *Kanjur*, produced not only the first printed edition of the Tibetan *Kanjur*, but also one of the first printed Tibetan book collections known so far.<sup>6</sup> Since the 17th century, *Kanjur* sets have also been edited and produced in Tibet.

#### Methodology<sup>7</sup>

This study of paper is based on the optical characteristics of the material, focusing on:

##### 1) *Fibre composition*

The components of raw materials provide the most useful information for typology. The distinct character of any paper derives, much more than is generally known, from the raw materials used in its creation.<sup>8</sup> Fibres constitute the basic components of any paper sheet, and therefore the determination of the fibre composition is essential for characterizing the paper. Optical microscopy, which uses visible light and a system of lenses to magnify images of small

samples, allows for fibre composition identification. The key features of the fibres of the papers examined are the general shape and dimensions of the fibres, cross and longitudinal markings on the fibre surface, the shape of the ends of the fibres, irregularities in the fibre walls, and the type and size of the associated cells of the sample. The results are compared to a fibre atlas.<sup>9</sup> In some cases the observations made with regard to fibres were also compared with the parameters of particular species recorded in the samples of raw materials that were taken directly from plants by the author. Thus the comparative study of historical and new specimens allowed for collecting fingerprint information<sup>10</sup> about paper.<sup>11</sup>

##### 2) *The papermaking sieve prints and other technological information sealed in the paper structure*

The papermaking sieve prints and fibre distribution patterns produced during sheet formation can be read in historic papers independently from changes due to aging. For example, handmade wove paper is characterized by the textile print on the surface, whereas handmade laid paper is characterized by the particular number of laid lines measured at a distance of three centimetres that are visible in the paper structure against the light. They can be distinguished depending on what type of papermaking sieve was used.

##### 3) *The preparation of the leaves before writing or printing*

This includes the structure of the leaf and the visual properties of its surface, such as dyeing the paper or applying insect-repelling substances - which may also change the colour of raw paper - sizing the paper, gluing it in layers, and polishing its surface. This type of criteria in particular shows the difference between paper prepared for manuscripts and paper used for prints.

Knowledge of the technology of paper production – as determined from the papermaking sieve pattern sealed in the paper structure and from the kind of plant used for its production and identified during microscopic examination – is essential, since such information allows for creating an objective typology. Through this approach to examine the paper structure the manuscripts cannot be dated directly; however, by comparing the results of fibre analyses in particular manuscripts we can learn more about the geographical origin of the paper and the region where the plant used for making this specific paper occurred. The prospective typology regarding the differences in papermaking technology can thereby also provide clues as to the region of a book's origin,

<sup>5</sup> These volumes are located in the Pander Pantheon section (vols. 23–28, 38–57, 59–60) of the Pander collection kept in the Jagiellonian University Library in Poland; *Wanli* again is the reign name of an emperor (r. 1572–1620). For more details on this collection, see: Pander 1890, Mejor et al 2010.

<sup>6</sup> For the history of Tibetan printed works see: Harrison 1996, 81 and Shaeffer 2009, 9.

<sup>7</sup> I based this methodology on standard procedures used for conservation. However, I selected and modified it for the purpose of typology and history of books and paper. See: Helman-Ważny 2009b, 67–75.

<sup>8</sup> Helman-Ważny 2006.

<sup>9</sup> Ilvessalo-Pfäffli 1995.

<sup>10</sup> Fingerprint information is a complex of features sealed in paper, which can be used for identification of a particular type of paper.

<sup>11</sup> Fibre examinations were performed by the author of this article at the Department of Plant Biology, Cornell University.

since we generally know the geographical range in which a particular type of papermaking mould was used. Differences in sheet formation should be classified in a similar way and should also become part of this typological approach.<sup>12</sup> Once a paper typology for Tibetan *Kanjur* editions is established, it will be much easier to classify all other newly found *Kanjur* fragments.

#### Results: Patterns in *Kanjur* volume sets

All *Kanjur* volumes examined are distinguished by their large size. However, a variety of sizes and visual appearances of paper were documented.<sup>13</sup> Particular volumes differ in the number of paper layers glued together and the character of the paper surface. Paper was prepared differently for handwritten manuscripts and for xylograph prints.

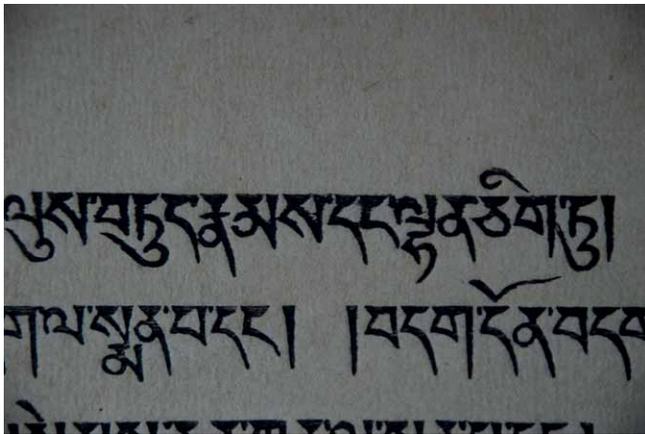


Fig. 1: Fragments of the first sub-type of paper from vol. 23 of the *Wanli Kanjur* set. Collection of the Jagiellonian University Library, Cracow.

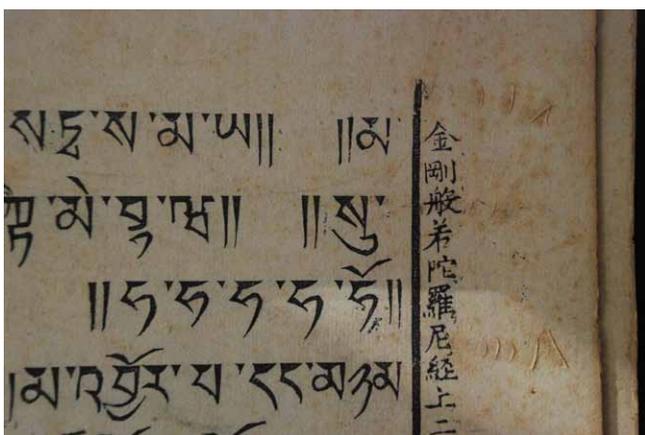


Fig. 2: Fragment of the second sub-type of paper from vol. 11 of the *Wanli Kanjur Supplement* set. Collection of the Jagiellonian University Library, Cracow.

<sup>12</sup> Methods of paper examination and record of paper features are discussed in van Staalduinen, Lubbe, Backer, and Paclik 2006, 346–353.

<sup>13</sup> Cp. table 1 at the end of article.

I was able to identify three different groups as to the regional origin of particular sets of Tibetan *Kanjur*. The first such group comprised the earlier *Kanjur* editions produced in China. These are the *Yongle* and *Wanli* sets plus the Berlin manuscript copy of the *Yongle/Wanli* edition as well as the *Wanli Supplement* and the fragment from the *Kangxi* editions. All of these sets of volumes were executed on paper produced in China, which is characterized by the same or at least a very similar measurement of leaves but is made of a variety of different fibres.

Leaves in all sets examined from this group were glued in multiple layers. Increasing the thickness of the paper by gluing it together to create layers was necessary, because thinner paper would not ensure the stability needed for a large format. The leaves of the *Kangxi* volume in Cracow, which was not directly modelled on either the *Yongle* or the *Wanli* edition, are slightly larger than those in the *Wanli Kanjur* and *Wanli Kanjur Supplement* but smaller than in the handwritten copy of the *Wanli Kanjur* kept in Berlin.

Furthermore, even within a group of sets written on the same general type of paper I discovered differences in the components, quality and outward appearance of the paper. For example, the paper of the *Yongle* and *Wanli Kanjur* volumes is much whiter and of better quality than the one used in the later sets of the *Kanjur* produced in China, although both types are characterized by very similar laid lines printed in the paper structure. Therefore I could distinguish two sub-types. The *Yongle* and *Wanli* editions belong to the first sub-type, whereas later sets starting from the *Wanli Kanjur Supplement* volumes represent the second sub-type of paper, clearly differentiated by hue, fibre components and, generally speaking, its minor quality (figs. 1 and 2).

Another difference between these two sub-types can be detected by examining the paper composition. The leaves of the *Yongle* and *Wanli* volumes are composed of more layers of paper than those of the *Wanli Supplement* volumes, the Berlin manuscript copy of *Wanli* volumes, and the *Kangxi Kanjur* volume. The underlying pattern here is that the thinner paper of better quality in the *Yongle* and *Wanli* editions was made of paper mulberry and required the addition of more layers of paper in order to prepare a leaf suitable for a large format in regard to stability (first sub-type). A leaf consisting of slightly thicker and more absorbent (softer) paper made of mixed components, as identified in the second sub-type, does not require so many layers of paper in order to be adequate and strong enough for printing.

By analysing the paper structure, information could be obtained about the type of sieve attached to the papermaking mould used. This laid lines fingerprint pattern suggests that the paper of the *Kanjur* sets from Beijing was produced by

dipping technique and by using a mould with a moveable type of sieve. This type of mould with fine laid lines (24–33 in 3 centimetres), which is used in all sets of *Kanjur* examined in this group, was not used in Tibet. Tibetans used a woven type of mould made of textile attached to a wooden frame. Those materials were easier to obtain in Tibet, where bamboo or reed does not grow. Thus the aforesaid laid sieve print confirms the Chinese origin of these papers. Chain lines were usually not visible due to the many layers of paper glued together.

I noticed differences between these two sub-types of paper at all levels of my examination. However, all these differences in the quality and outward appearance of the paper result from the different raw materials used for making particular types of paper. The *Yongle* and *Wanli Kanjur* were printed on paper made of plain paper mulberry. Given its extremely long fibres, this plant can produce very strong and thin paper (fig. 3).



Fig. 3: Paper mulberry fibres in polarized light visible on image at 150 x magnification composing the paper of the *Wanli Kanjur* (vol. 60 of the Pander Pantheon collection) from the Jagiellonian University Library, Cracow.

The volumes of the *Wanli Kanjur Supplement*, which was printed at the same time as the *Wanli* edition or shortly thereafter, already represent a poorer paper quality. Regarding the quality, technology, and raw material, the paper of the *Wanli Supplement* is very similar to the paper found in the volume examined of the *Kangxi* edition of the Tibetan *Kanjur*. I detected three types of cells in those papers: paper mulberry fibres (cut short), pitted wood/bamboo tracheids or vessels, and narrow straw fibres with pointed ends (fig. 4).

Plain paper mulberry fibres produce much stronger, more elegant and better quality paper than those mixed with bamboo and straw. The addition of straw mixed with bamboo, however, makes paper softer but at the same time

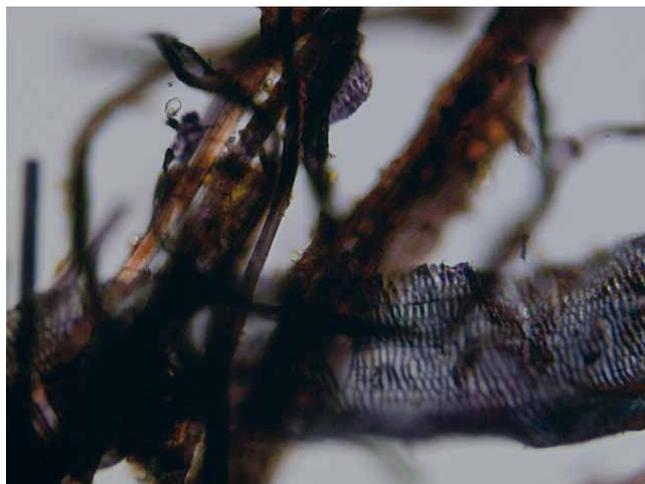


Fig. 4: Paper mulberry fibres and bamboo vessel in polarized light visible on image at 600x magnification composing the paper of the *Wanli Kanjur Supplement* (vol. 5 of the Pander Pantheon collection) from the Jagiellonian University Library, Cracow.

less durable. Such a type of paper is especially suitable for printing. The same type of paper, when used for writing, needs more processing. Commonly used sizing substances, such as starch or plant extracts, had to be applied on the paper surface before writing, sometimes together with additional fillers such as rice starch, white powder or chalk. Then the sized sheet of paper was finished by polishing the surface with shell or semi-precious stone. The handwritten copy of the *Wanli Kanjur* kept in Berlin is a good example of such elaborate processing.

The only sets examined of *Kanjur* produced in Eastern Tibet are the *Cone* and *Derge* editions. These places are located quite distantly, about 1,000 km from each other. Additionally, the copy examined from *Cone* cannot be directly compared to the *Derge Kanjur* set, since its volumes were printed much later (in 1926) from original wooden blocks carved in 1721–31.<sup>14</sup> At that time it was probably common in the region to order paper from other parts of China.

The paper used for the *Cone* editions is not the same as the one used for the *Derge* editions. *Cone* paper has typically ‘Chinese’ characteristics and is made from specific fibre components (paper mulberry and straw), (fig. 5).<sup>15</sup>

<sup>14</sup> The woodblocks for this set were produced in the area of the Cone Monastery at the beginning of the 18th century. This set, composed of 108 volumes, was purchased for the Library of Congress in 1926 at the Cone Monastery in the Gansu Province, China, by the botanist Joseph F. Rock. For more information about the provenance of this set see Meinheit 2009.

<sup>15</sup> I use ‘Tibetan’ and ‘Chinese’ in this context only as terms for certain types of paper without implying a particular place of origin or the ethnicity of the producers. However, from the evidence assembled here it is quite clear that we observe indeed a regional distribution with East Tibet being the zone of interaction.



Fig. 5: Paper of the *Cone Kanjur* in volume 1 *mdo* shows the presence of paper mulberry and straw fibres in 60x magnification.

However, the size of the leaves is visibly smaller when compared to those of the editions produced in the Beijing area and described above. Due to their smaller format, the leaves of the *Cone* set are composed of 23 layers – much fewer than the leaves of volumes from the earlier editions. However, the laid lines pattern in the *Cone* paper is characterized by about 27 laid lines spanning 3 centimetres, which is exactly the same pattern as in the earliest editions of Tibetan *Kanjur* sets produced on Chinese paper.

Derge paper belongs to a typically Tibetan type made of the *Thymelaeaceae* family plants (fig. 6).<sup>16</sup> This paper is

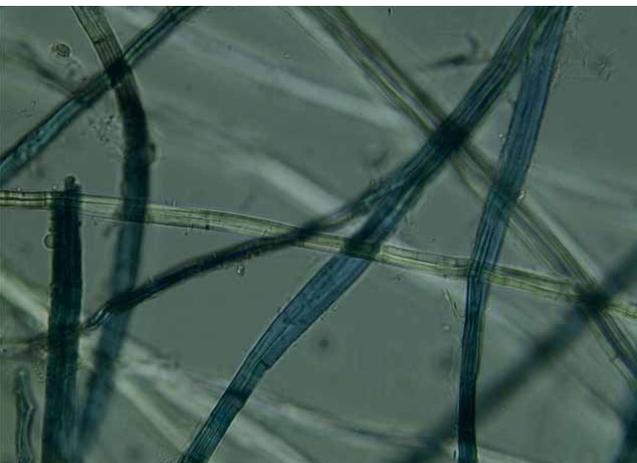


Fig. 6: *Daphne* or *Edgeworthia* sp. fibers in polarized light visible on image at 600x magnification composing the paper of the vol. 45 of *Derge Kanjur* acquired by William Rockhill in 1908. Tibetan Rare Book Collection, Asian Division, The Library of Congress, Washington DC.

<sup>16</sup> *Thymelaeaceae* family plants are reported by many scholars in the context of paper production in the Himalayan region and India only. I cannot exclude that these plants were also used in China from time to time for very specific purposes, since they occur in some regions of China. However, there is no reason to believe that Chinese communities used *Thymelaeaceae* plants for making paper used for books, since authors such as Tsien, Hunter or Pan Jixing never mentioned such use (cp. fn. 17).

of a much darker (brownish) colour than that of *Cone*, and the paper structure is characterized by many external bark particles and fibre bundles. When creating the paper for the *Derge Kanjur* set, both the woven and the laid papermaking mould were used. The examined *rgyud* volume 77 of the *Derge Kanjur* was printed on paper made by a woven type of mould. For the other two volumes examined from other parts of this *Kanjur*, paper was made on a bamboo sieve characterized by 15 laid lines spanning 3 centimetres. This type of mould was used in Tibetan borderland provinces and in Bhutan.<sup>17</sup> Some of the old Dunhuang papers show very similar laid line characteristics.<sup>18</sup> Typically, Tibetan papermaking moulds are woven. However, there are much more similarities between both editions produced in Eastern Tibet when taking into consideration the style of particular volumes. For example, the leaves of the *Cone* and *Derge Kanjur* sets are visibly smaller than leaves in the sets of the Beijing editions of the Tibetan *Kanjur*. Their proportions are more similar to the format of a palm leaf.



Fig. 7: *Daphne* or *Edgeworthia* sp. fibers in polarized light on image at 300x magnification composing the paper of the *Narthing Kanjur* from the Berlin State Library.

The third group includes sets of *Kanjur* produced in the central part of Tibet, the Lhasa area. The *Narthing* and *Lhasa Kanjur* sets belong to this group. All volumes examined were printed on the same typical Tibetan paper made of *Daphne* or *Edgeworthia* sp. of the *Thymelaeaceae* family plants (fig. 7). All volumes from this group were printed on one-layer paper of uneven thickness presenting a structure characterized by many outer bark particles and fibre bundles. The quality of the *Narthing Kanjur* paper is not as good as the paper quality of the *Lhasa Kanjur*. However, in both editions the quality

<sup>17</sup> Imaeda 1989.

<sup>18</sup> For example, see: Or.8210/S.1524, Or.8210/S.4528, Or.8210/S.2105, Or.8210/S.6492 dated to 6th century CE.

of printing is worse than in all previously described editions produced in China. This is due to the features of the Tibetan paper, which is very durable and has a slightly glossy surface that is not as absorbent as that of Chinese papers. All sets of *Kanjur* in this group were made of one layer of paper. If the paper layers were glued together, this would lead to perfect material for writing, which, however, would be more difficult to print on. In fact, the usage of Tibetan paper may also be one of the reasons why in Tibet manuscripts were widely produced simultaneously with printed books until the 20th century.

### Resumee

Finally, I could distinguish two main types of paper used in the sets of Tibetan *Kanjur* examined as well as further sub-types. The main differences between the two types can be found in the fibre composition and traces of the type of papermaking sieve sealed in the paper structure. In Tibet, primarily *Thymelaeaceae* family plants were used for producing paper. This clearly distinguishes Tibetan paper from Chinese paper, which is composed of a variety of plants such as paper mulberry, bamboo, and straw among many others.<sup>19</sup> Tibetan papers in the different *Kanjur* volumes do not represent a large variety, whereas the Chinese papers allow for distinguishing more sub-types, which is very promising in the context of creating a precise typology in the future. Early *Kanjur* sets produced in China used paper made of pure paper mulberry fibres, whereas later volumes were printed on mixed fibre components. Regarding regional origin, all *Kanjur* sets produced in the Beijing area were printed on typically Chinese paper, and all sets produced in the Lhasa area were printed on the Tibetan type of paper made of *Daphne* or *Edgeworthia* sp. of the *Thymelaeaceae* family plants. In Eastern Tibet, both types of paper were used.

I discovered the same difference in paper features when examining fingerprint patterns of papermaking sieves used. The majority of Tibetan papers were made by means of a woven type, and all Chinese papers were characterized by about 24–30 laid lines spanning 3 centimetres. In the *Kanjur* sets examined, Tibetan types of paper were produced by means of both mould types – woven and moveable bamboo sieve, whereas Chinese types of paper were made by using a mould with a bamboo or grass sieve.

The comparative examination of different *Kanjur* sets shows the technical similarities between different editions, and their re-prints and re-editions, when supported by a research on paper including the examination of other physical

features of particular volumes. The relation between a master copy and the subsequent edition of the *Kanjur* (which was modelled on this master copy) is also characterized by paper features, as was clearly evident in the case of the *Yongle* edition, its *Wanli* reprint and consecutive re-editions. I found out that raw materials changed in time and techniques of papermaking evolved that allow for dating other volumes to a particular period or identifying their place of origin.

This research allowed for drafting a preliminary paper typology, which should be supported by more *Kanjur* volumes to be examined. In the future I am planning to create a data base of paper features derived from Chinese and Tibetan books dated to different periods and originating from different places. This will be linked to my collection of papermaking plants including keys for identification and mapping of their distribution. I believe this will lead to a clearly more precise identification of book paper. Finally, this research appears to be very promising for identifying newly found fragments of the Tibetan *Kanjur*, which are still widely discovered.

### Acknowledgements

Research for this article was conducted at the following institutions:

University of Michigan in Ann Arbor, supported by the staff of the Department of Asian Languages and Cultures and the Special Collections Library. My gratitude is in particular directed to Prof. Dr. James Robson (Harvard University, previously University of Michigan), Dr. Peggy Daub (Special Collections Library), and Shanon Zachary (Conservation Studio).

Jagiellonian University Library in Cracow, supported by the staff of the Manuscripts Department Reading Room. My gratitude for fruitful cooperation is especially directed to Prof. Dr. hab. Zdzisław Pietrzyk and Dr. Monika Jaglarz. This research was funded by the Polish Ministry of Science (grant: ‘The lost fragment of the *Wanli bka’ gyur* in the Jagiellonian Library? The value of authenticity of Tibetan books from the Pander Collection in Poland’) Thanks to this special support, together with my colleagues from the Faculty of Oriental Studies, University of Warsaw, Prof. Marek Mejer and Dr. Thupten Kunga Chashab, I had the chance to work on this valuable collection.

Harvard University in Cambridge, supported by the staff of the Sanskrit and Indian Studies Department and the Harvard-Yenching Library Reading Room. I am very grateful to Prof. Leonard W. van der Kuijp for his kind assistance and advice.

Berlin State Library, supported by the staff of the Orientabteilung, Staatsbibliothek zu Berlin - Preußischer Kulturbesitz. I am very grateful to Dr. Michael Balk for his kind assistance and constant support.

Library of Congress, supported by the staff of the Asian Reading Room. My gratitude is especially directed to Dr. Susan Meinheit.

<sup>19</sup> For further information on Tibetan and Chinese papermaking, see Hunter 1932 and 1978; Meisezahl 1958, 17–28; Trier 1972; Tsien 1973, 510–519; Tsien 1985; McClure 1986; Koretsky 1986; Pan 1998; Helman-Ważny 2005 and 2006, 27–37 and 3–9.

Table 1: Characteristic features of paper in particular sets of Tibetan Kanjur

No.	Set Examined fragment	Present Location	Dating	Place of production	Size of leaves height × length cm
1.	<i>Yongle Kanjur</i> : folio 12 of the <i>Samādhirāja-sūtra</i>	Special Collections Library at the University of Michigan, Ann Arbor, USA	1410	Beijing	24.2–24.5 × 68.7–69
2.	<i>Wanli Kanjur</i> : the twenty-eight volumes: Nos. 23–28 ( <i>rgyud</i> ), 38–57 (nos. 38–55 = <i>rgyud</i> ; 56 = <i>mdo</i> ; 57 = <i>rgyud</i> ), 59 ( <i>rgyud</i> ), 60 (index – <i>dkar chag</i> )	Jagiellonian University Library in Cracow, Poland (Biblioteka Jagiellońska w Krakowie)	1606	Beijing	23.8–24.5 × 68.5
3.	<i>Wanli Kanjur</i> Supplement: Pander Pantheon: volumes 1–22	Jagiellonian University Library in Cracow, Poland (Biblioteka Jagiellońska w Krakowie)	1606–1607	Beijing	approximately 23.8–24.5 × 68.5
4.	<i>Wanli Kanjur</i> Supplement: volumes <i>tsa</i> and <i>ku</i> of the <i>Wanli Supplement</i>	Harvard-Yenching Library in Cambridge MA, USA	1606–1607	Beijing	approximately 23.8–24.5 × 68.5
5.	‘ <i>Handwritten Kanjur of Berlin</i> ’: vol. 1, <i>ka</i> ; vol. 24 Part 1 and Part 2, <i>nya</i> ; vol. 17 Part 1 and Part 2, <i>ka</i> ; vol. 18 Part 1 and Part 2, <i>kha</i> ; vol. 108 Part 1 and Part 2, <i>ja</i> ; vol. 85 Part 1 and Part 2, <i>ka</i> plus 64 folios of <i>dkar chag</i> attached to this volume)	Berlin State Library, Germany (Staatsbibliothek zu Berlin Preußischer Kulturbesitz)	1680	Beijing	approximately 26.8–29 × 68.9–73.3

Fibre composition	Papermaking sieve print (number of laid lines in 3cm and chain line intervals if visible)	Structure of the leaf and visual properties of its surface
paper mulberry ( <i>Broussonetia</i> sp.)	27–30	six or more layers glued together; good quality and well preserved paper
paper mulberry ( <i>Broussonetia</i> sp.); within the <i>Wanli</i> set the best quality (longest) fibres were used for volume 60 ( <i>dkar chag</i> ); the volumes of the <i>rgyud</i> (Tantra) section were produced on medium quality raw material	24 some of the papers show pattern 15–18; chain lines visible in volume 28: distances between them as follows: 3cm-2cm-3cm-2cm-2,5cm-2,5cm-2,5cm-2,5cm. paper.	six or more layers glued together; the paper on which laudation text is written has about four layers, which makes leaves thinner; good quality and well preserved paper
paper mulberry, straw, and bamboo	laid paper	six or more layers glued together
paper mulberry, straw, and bamboo	laid paper	six or more layers glued together
bamboo, straw, jute and paper mulberry	laid paper characterized by 9–11 laid lines in 1cm	three or more layers glued together; highly sized and polished; possibly also covered by other substances increasing its whiteness

No.	Set Examined fragment	Present Location	Dating	Place of production	Size of leaves height × length cm
6.	one of several corrected reprints of the <i>Kangxi Kanjur</i> edition: <i>sher phyin, Tha</i> (volume 58 from the Pander collection)	Jagiellonian University Library in Cracow, Poland (Biblioteka Jagiellońska w Krakowie)	1684–92	Beijing	approximately 24.5–25.5 × 71.5
7.	<i>Cone Kanjur</i> : Vol. 1 <i>mDo</i> (sutra), <i>ka</i> ; vol. 35 <i>'Dul-ba (Vinaya), ga</i> ; vol. 92 <i>Yum, ka</i> ; vol. 108 <i>dKar chags</i> (Index); vol. 72 <i>rgyud</i> (tantra); Original Paper Strings from <i>Cone Kanjur</i>	Library of Congress, Washington, D.C., USA	1721–31 (the copy examined was printed in 1926)	Cone	approximately 18–18.5 × 56.5–57
8.	<i>Narthang Kanjur</i> : vol. 1 <i>'Duk-ba, ka</i> , and vol. 2 <i>'Dul-ba, kha</i>	Berlin State Library, Germany (Staatsbibliothek zu Berlin Preußischer Kulturbesitz)	1730–32	Narthang	approximately 17–18 × 61.5–63.5 (certain folios are not evenly cut)
9.	<i>Derge Kanjur</i> : <i>tnaya, ka</i> ; vol. 45 <i>mDo-sde</i> (sutra) part volume, <i>ka</i> ; vol. 77 <i>rGyud-hbum</i> (tantra), <i>ka</i> .	Library of Congress, Washington, D.C., USA	1733	Derge	approximately 10–11.5 × 60.5–62
10.	<i>Lhasa Kanjur</i> : vol. 1 <i>'Duk-ba, ka</i> , vol. 1 <i>'Dul-ba, ka</i> , and vol. 2 <i>'Dul-ba, kha</i>	Berlin State Library, Germany (Staatsbibliothek zu Berlin Preußischer Kulturbesitz)	1934	Lhasa	15.5–17.5 × 62.8–64 (certain leaves are not evenly cut)

Fibre composition	Papermaking sieve print (number of laid lines in 3cm and chain line intervals if visible)	Structure of the leaf and visual properties of its surface
paper mulberry, bamboo, and straw	laid paper with hardly visible structure	three or more layers glued together
paper mulberry and straw	laid paper characterized by about 9 laid lines in 1cm; chain lines not visible; a paper fragment with a title (label) printed on a lotus flower in the first volume [ka] of mDo shows the same chain and laid lines pattern as paper leaves; here one may detect chain lines within a distance of 3.5 to 4 cm from each other	slightly yellowish (cream), stuck together to form two or possibly three layers; absorbent and soft; glued using diluted starch paste rather than any kind of animal glue; two leaves (ms folio 244 in vol. 35 and ms folio 289 in vol. 92) handwritten on much thicker paper in which more layers were glued together to allow for writing with a bamboo or wooden stick; surface of the leaf polished with stone before writing
<i>Thymelaeaceae</i> family plants ( <i>Daphne</i> or <i>Edgeworthia</i> sp.)	both a woven type of paper made with thick textile as woven sieve and possibly a finely woven cotton sieve, and a laid paper characterized by about 5 laid lines in 1cm were used when producing this paper	very thin one-layered paper with glossy surface of uneven thickness; the middle part of the volume was printed on visibly worse paper quality; fibre bundles and outer bark particles in the paper structure
<i>Thymelaeaceae</i> family plants ( <i>Daphne</i> or <i>Edgeworthia</i> sp.)	laid paper characterized by 5 laid lines in 1cm; chain lines within a distance of 3-4cm in volumes 1 and 45; paper in <i>rgyud</i> volume 77 produced by means of a mould with a woven type of sieve	one-layered, soft and absorbent paper characterized by a brownish color and slightly glossy surface (possibly polished); the thickness of the paper differs in different leaves; many fibre bundles and fragments of outer bark in its structure caused by an inadequate amount of well-separated fibres
<i>Thymelaeaceae</i> family plants ( <i>Daphne</i> or <i>Edgeworthia</i> sp.)	both a woven type of mould and a laid mould characterized by about 7 laid lines in 1cm; the woven mould had a sieve made of loosely woven textile, which is clearly visible in the paper structure	one-layered, very thin paper with visible fibre bundles in its structure and a slightly glossy surface; the thickness of the paper and its quality differs in different leaves: some leaves are almost brown showing more particles of outer bark in their structure

## REFERENCES

- Eimer, Helmut (2000), 'Spurensicherung: Das verschollene Berliner Fragment des Wanli-Kanjur', *Zentralasiatische Studien*, 30: 27–51.
- Eimer, Helmut (1992), *Ein Jahrzehnt Studien zur Überlieferung des tibetischen Kanjur* (Wien: Arbeitskreis für Tibetische und Buddhistische Studien, Universität Wien).
- Hall, Bruce Cameron (1979), *A descriptive list of the Tibetan (Tib.) Collection in the Rare Books of the Harvard-Yenching Library* (Cambridge; Unpublished typescript revised in 1980 as a PhD thesis at the Sanskrit Department of Harvard University).
- Harrison, Paul (1996), 'A Brief History of the Tibetan Kanjur', in José Ignacio Cabezón, Roger R. Jackson (eds.), *Tibetan Literature. Studies in Genre* (Ithaca, New York: Snow Lion).
- Helman-Ważny, Agnieszka (2005), 'Tibetan Historic Manuscripts as a Source of Information on Past Papermaking in Inner Asia', *IPH Congress Book*, 27–37.
- (2006), 'Asian Paper in Works of Art: a Comparative Fiber Analysis', *Hand Papermaking*, 21, 2: 3–9.
- (2009a), 'Recovering a Lost Literary Heritage: Preliminary Research on the Wanli Kanjur from Berlin', *Journal of the International Association of Tibetan Studies*, 5: 27 pp. (<http://www.thlib.org/collections/texts/jiats/#!jiats=/05/helmanwazny/>).
- (2009b), *Sztuka Tybetańskich Ksiąg Klasztornych* (Warszawa: Trio).
- Hunter, Dard (1932), *Old Papermaking in China and Japan* (Chillicothe, Ohio: Mountain House Press).
- (1978), *Papermaking. The History and Technique of an Ancient Craft* (New York: Dover Publications).
- Ilvessalo-Pfäffli, Marja-Sisko (1995), *Fiber Atlas: Identification of Papermaking Fibers* (Berlin – Heidelberg: Springer-Verlag).
- Imaeda, Yoshiro. (1989), 'Papermaking in Bhutan', *Acta Orientalia Academiae Scientiarum Hungaricae*, 43,2–3: 409–414
- Koretsky, Elaine (1986), 'Papermaking Today in Tibet and China', *Hand Papermaking*, 1,1: 2–6.
- McClure, Floyd Alonzo (1986), *Chinese Handmade Paper*, with a preface by Elaine Koretsky (Newtown).
- Meinheit, Susan (2009), 'Notes on the Co ne Bka' gyur and Bstan gyur in the Library of Congress, Washington, D.C.', *Journal of the International Association of Tibetan Studies* 5, 14 pp. (<http://www.thlib.org/collections/texts/jiats/#!jiats=/05/meinheit/>).
- Meisezahl, Richard Othon (1958), 'Bemerkungen zu tibetischen Handschriften des 17.-19. Jahrhunderts, ergänzt durch die mikroskopischen Untersuchungen im Institut für Cellulosechemie der Technischen Hochschule Darmstadt', unter Mitwirkung von M. Harders-Steinhäuser und Georg Jayme, *Papiergeschichte*, 8,2: 17–28.
- Mejor, Marek, Agnieszka Helman-Ważny, and Thupten Kunga Chashab (eds.) (2010), *A Preliminary Report on the Wanli Kanjur Kept at the Jagiellonian Library*, (Kraków. Research Centre of Buddhist Studies, Faculty of Oriental Studies, University of Warsaw; Warsaw Studia Buddhica 1).
- Pan Jixing 潘吉星. (1998), *Zhongguo kexue jishu shi. Zaozhi yu yinshua juan* 中国科学技术史.造纸与印刷卷 (Beijing: Kexue chubanshe 科学出版社).
- Pander, Eugen (1890), *Das Pantheon des Tschangtscha Hutuktu. Ein Beitrag zur Iconographie des Lamaismus*, herausgegeben und mit Inhaltsverzeichnissen versehen von Albert Grünwedel, (Berlin).
- Schaeffer, Kurtis R. (2009), *The Culture of the Book in Tibet* (New York: Columbia Univ. Press).
- Silk, Jonathan A. (1996), 'Notes on the History of the Yongle Kanjur', in: *Suhrlekhāh: Festgabe für Helmut Eimer*, ed. by Michael Hahn, Jens-Uwe Hartmann and Roland Steiner. (Swisttal-Odendorf; Indica et Tibetica 28), 153–200.
- van Staalduinen, Mark, van der Lubbe, Jan C.A., Backer, Eric and Paclik, Pavel (2006), 'Paper Retrieval Based on Specific Paper Features: Chain and Laid Lines', in Bilge Günsel, et al. (eds.) *Multimedia Content Representation, Classification and Security*, (Berlin-Heidelberg; Lecture Notes in Computer Science), 346–353.
- Trier, Jesper (1972), *Ancient Paper of Nepal: Result of Ethno-technological Field Work on its Manufacture, Uses and History – with Technical Analyses of Bast, Paper and Manuscripts* (Copenhagen: Jutland Archaeological Society Publications X).
- Tsien, Tsuen-Hsui (1973), 'Raw Materials for Old Papermaking in China', *Journal of the American Oriental Society*, 93, 4: 510–519.
- (1985), *Paper and Printing*, Vol 5, part 1 of *Science and Civilisation in China*, Joseph Needham (ed.) (Cambridge: Cambridge Univ. Press).

## PICTURE CREDITS

Fig. 1 – 7: © Photographs Agnieszka Helman-Ważny