A Preliminary Study on the Application of Inlaying Technique in the Conservation of Letters by Notable Persons: A Case Study of "Lin Songhe's Letters" from the Nankai University Library Collection (Postprint)

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Abstract

[Objective/Significance] The "Lin Songhe Letters" were acquired by the Nankai University Library in 2020. The collection primarily consists of 446 letters totaling 941 pages, written by Lin Songhe to Liu Biyi between 1921 and 1937. Restoring these letters enables the systematic compilation of the "Lin Songhe Letters" for research use by readers. [Method/Process] Under the guidance of mentor Wan Qun at the Nankai University Conservation Studio, three conservation trainees analyzed the physical format of the entire collection. After discussion, they determined to employ the "excavated lining" method to compile all letters into volumes in the binding style of thread-bound books. Together, they completed the restoration work, including measuring dimensions, paper matching, flattening, mending, excavated lining, cover making, and binding. [Result/Conclusion] The restoration produced the "Lin Songhe Letters" in four cases containing twenty volumes, and analyzed the technical issues encountered during the restoration process and the significance of preservation upon completion.

Full Text

Application of the "Digging and Lining" Technique in the Restoration of Celebrity Letters: A Case Study of Lin Songhe's Manuscripts at Nankai University Library

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Abstract:
[Purpose/Significance] Lin Songhe's manuscripts were acquired by Nankai University Library in 2020. The collection comprises 446 letters totaling 941 sheets, written by Lin Songhe to Liu Biyi between 1921 and 1937. Restoring these manuscripts enables their systematic organization for scholarly research and use. [Method/Process] Under the guidance of Master Wan Qun at the Nankai University Training Institute, three restoration apprentices analyzed the physical characteristics of the entire manuscript collection. After deliberation, they adopted the "digging and lining" method to assemble all letters into thread-bound volumes, jointly completing tasks including measurement, paper selection, flattening, mending, digging and lining, cover mounting, and binding. [Result/Conclusion] The project produced twenty thread-bound volumes housed in four protective cases, while analyzing technical challenges encountered during restoration and the collection's preservation significance post-restoration.

Keywords: Lin Songhe's manuscripts; restoration; digging and lining

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In June 2020, Nankai University was approved to establish a national-level ancient books restoration skills training institute, which formally opened in October of the same year. To support its teaching mission, Master Wan Qun selected "celebrity letters" as an entry point for transmitting restoration techniques.

Celebrity letters possess unique characteristics among transmitted documents—they typically exist as single copies without duplicates, granting them significant academic, collectible, and artistic value. Due to these precious qualities, collectors have generally maintained them with great care, resulting in relatively good preservation conditions. This makes celebrity letter restoration particularly suitable for training institute curricula, allowing for progressive skill development from basic to advanced levels.

Currently, academic research on celebrity letters has largely focused on literary content and calligraphic appreciation, with few restoration specialists conducting theoretical studies or summarizing practical experience. Most restoration case studies have concentrated on rare books and precious ancient volumes in libraries and museums.

1. Overview of Lin Songhe's Manuscripts

Lin Songhe's manuscripts entered Nankai University Library's collection in 2020 through donation by Lin's descendant, Mr. Bian Xiaochun. The original collector, Liu Biyi, was the author's wife. The collection consists of letters Lin Songhe wrote to Liu Biyi after their marriage, totaling 446 letters across 941 sheets, dated from 1921 to 1937.

Lin Songhe (1902–1967), courtesy name Hanfu, graduated from Nankai University in 1926 before pursuing further studies at the London School of Economics.

Upon returning to China, he served as a part-time lecturer at Tsinghua University, researcher at the Institute of Social Surveys, and manager of the China Industrial Bank. His publications include *Survey of Tanggu Workers*, *First Annual Yearbook of Chinese Labor*, *Statistical Charts of Beijing Social Conditions*, and *China's Industry and Labor*. His father, Lin Kaimo, earned the jinshi degree in the Guangxu era and served as a compiler at the Hanlin Academy. Liu Biyi (1905–2002), known as Shisheng, came from a distinguished family—her father Liu Tiqian was a Qing dynasty Huai Army general, and her mother Li Jishu was the daughter of Li Zhaoqing, younger brother of Li Hongzhang. Lin and Liu married in Shanghai in November 1921.

2. Restoration Process

2.1 Basic Information on the Manuscripts Upon acquisition, the donor had stored the manuscripts in loose-leaf binders. Overall preservation was good, with minor creasing being the most prominent issue. Some letters exhibited edge loss, tearing, and iron gall ink corrosion.

Before establishing the restoration plan, we measured the length, height, and thickness of each manuscript and conducted sampling tests on paper materials. Most letters were written on handmade letter paper from the Republican period. Due to Lin's European study experience, manuscripts from 1929–1930 were primarily on machine-made paper, with some postcards included. Measurements revealed the largest single leaf measured 29.5 × 21.6 cm. Excluding smaller foreign machine-made papers and postcards, most handmade letter paper did not exceed 28 × 20 cm, with only four pieces at maximum size. The thickest manuscript measured 0.36 mm—thicker items were primarily postcards, name cards, and photographs from Lin's Nankai University days, mostly multilayered machine-made papers. Some handmade letter paper exhibited uneven thickness due to inconsistent pressure during the papermaking process. For data recording, we entered multiple values, using measurements from thicker areas as reference data for restoration preparation. This variation in single-leaf thickness represented an objective issue that could not be resolved during restoration, potentially resulting in minor unevenness in the final bound volumes.

2.2 Establishing the Restoration Plan A restoration plan is a comprehensive strategy formulated according to a document's condition, playing a crucial guiding role throughout the restoration process. Sun Congtian's *Essentials of Book Collection* states: "Book binding should not pursue ornate decoration, but rather proper protection, elegant style, appropriate thickness, and refined execution. Ancient times had various binding styles including Song editions, butterfly binding, and album formats." This passage demonstrates the historical importance of bookbinding and its diverse forms. For this manuscript restoration, we considered multiple binding options including tip-in mounting, thread binding with digging and lining, jinxiangyu butterfly binding, sutra binding, push-screen binding, and album mounting.

After discussion, given the collection's large quantity and diverse formats and materials, options like sutra binding or album mounting would require excessive paper and involve complicated procedures, making them neither economical nor efficient. Since the manuscripts were in relatively good condition with only minor damage, we adhered to the principle of "minimal intervention" to preserve their original appearance as much as possible, eliminating the jinxiangyu butterfly binding approach.

For convenient storage and future use, we ultimately decided to employ the "digging and lining" mounting method, assembling the lined double-leaf folios into thread-bound volumes. Severely damaged individual leaves requiring immediate repair would be treated accordingly before lining. Based on manuscript quantity, dates, and original arrangement, we planned volumes of approximately fifty letters each, totaling twenty thread-bound books. Five volumes would be housed in one protective case, making four cases total. According to the manuscripts' dimensions, we determined each thread-bound volume would measure 36 × 24 cm.

Digging and lining is a variation of the traditional "digging and mounting" technique used in calligraphy and painting conservation. As described in the literature: "Digging and mounting involves first mounting both the artwork core and mounting material to the same thickness, flattening them on a wall, cutting out a piece from the mounting material according to the artwork's shape and size, and then embedding the artwork into the mounting material." In applying this to manuscript restoration, each individual letter serves as the "artwork core," while the double-leaf folio functions as the "mounting material." However, analysis of pre-restoration thickness measurements revealed that for most manuscripts—even excessively thick ones—digging and mounting alone could not solve the problem of unevenness in the final thread-bound books. Therefore, lining paper needed to be added to the folios. Lining paper is traditionally used in ancient book restoration to address overly thin leaves: "If leaves are too thin, or the paper is brittle and difficult to flatten, a sheet of paper may be inserted between leaves—this is lining paper." In this application, lining paper serves to compensate for the thickness removed from the "folio," creating a level surface. This combined approach—integrating "digging and mounting" with appropriate use of "lining paper"—constitutes the "digging and lining" method.

For this restoration, double-layer folios (double-leaf lining) were required for digging and lining. For particularly thick machine-made papers and postcards, additional single-leaf lining paper was inserted within the double-layer folios to ensure the final thread-bound books would be perfectly flat.

2.3 Materials Digging and Lining Paper: We selected four-chi jingpi (pure bark) paper. Jingpi refers to "raw xuan paper containing approximately 40% sand field straw and 60% blue sandalwood bark, slightly thicker than cotton-based paper with relatively strong tensile resistance." Previous paper property

tests indicated jingpi thickness at approximately 0.095 mm, making it suitable as lining paper for this project. Jingpi also exhibits high tensile strength: "As the primary material for xuan paper production, blue sandalwood bark is a long fiber. Combined with short-fiber sand field straw, the greater the proportion of long fiber, the better the paper quality. Long fibers enhance tensile strength, bursting strength, and folding endurance." These characteristics ensure the manuscripts' preservation and usability after binding. Additionally, jingpi's whiteness matches well with most manuscripts.

Moisture Removal Paper: We selected dragon beard grass pulp paper as moisture removal paper. "Dragon beard grass fibers are characterized by being thin and long, with an average length-to-width ratio exceeding 200:1, a phenomenon rarely seen in other grass pulps." Since fiber length is a crucial determinant of water absorption—longer fibers yield better absorption—dragon beard grass pulp paper has excellent water absorption. Its soft texture also prevents secondary damage to manuscripts during moisture removal. This paper can be reused after natural drying.

Silk and Song Brocade: We selected mounted porcelain-blue silk for the thread-bound books' covers and dragon-pattern Song brocade for the six-sided protective cases.

Deacidified Board and Double Xuan Paper: Deacidified board was chosen for constructing the six-sided protective cases, while double xuan paper made from ordinary bark paper was used for case interiors.

Paste: Paste was prepared using a ratio of 500 grams of wheat starch to 1,500–2,000 grams of water. Water was added to create thick paste for case board adhesion and thin paste for manuscript lining. Paste concentration was adjusted according to manuscript thickness: for machine-made paper approximately 0.13 mm thick, thicker paste was used; for handmade letter paper, thinner paste was appropriate.

3. Restoration Techniques

3.1 Flattening Manuscripts Most manuscripts were in good condition, requiring only crease removal before lining. The standard method for removing creases involves spraying with water and pressing flat. A moisture removal paper is laid down, lightly sprayed with water, the manuscript placed on top, then covered with another moisture removal paper which is also sprayed. A brush is used to sweep from the manuscript's center outward, distributing moisture evenly to achieve flattening. Finally, pressing boards are applied until completely dry. Before this step, ink and red column water resistance must be tested: "Use a finger to apply a water droplet to the ink area, cover with absorbent paper, press with a finger, then check if ink bleeds onto the absorbent paper." If ink bleeds occurs, an iron is used instead. The manuscript is sandwiched between two xuan papers and ironed at 50°C for one minute, achieving the same flattening effect as water spraying.

3.2 Digging and Lining First, two lining papers are folded into a double-leaf folio. The manuscript to be lined is positioned and temporarily fixed at its four corners with spots of thin paste applied using a needle awl. Next, the awl is used to pierce through the lining paper at the manuscript's four corners. The inner folio is removed, and using the four needle holes as guides, lining paper corresponding to the manuscript's size is cut from the inner folio's front leaf. Finally, the trimmed folio is reinserted into the outer folio, and thin paste is applied along the spine edge to adhere the two folios together.

Lined manuscripts are stacked sequentially, with the manuscript side facing down and the lining side up. Pressing boards and ten-kilogram weights are placed on the lining paper to flatten. After stacking ten lined leaves, a small amount of water is evenly sprayed to maintain slight moisture while pressing, enhancing adhesion and flatness between manuscripts and lining paper.

This describes the standard method for regularly shaped manuscripts. However, the collection included several special formats, materials, and writing styles requiring particular treatment, discussed below.

3.2.1 Name Cards, Photographs, and Machine-Made Paper

The collection contains five of Lin Songhe's name cards and sixteen photographs taken during his Nankai University years. These materials exceed 0.35 mm in thickness—greater than the collection's average. Lining them using standard methods would create unevenness in the final thread-bound books, with 凸起 areas at these locations. To address this, we inserted additional single-leaf lining paper within the double-leaf folios. When cutting the lining paper, the single-leaf lining was removed together with the inner folio's front leaf, ensuring the removed thickness approximated that of the name cards and photographs, thus preventing 凸起 in the bound volumes.

During his 1929–1930 studies in Britain, Lin Songhe used machine-made paper, approximately 0.13 mm thick and quite rigid. Neither double-leaf lining nor additional single-leaf lining within double-leaf folios could ensure flatness in the final binding. We observed that these machine-made paper letters appeared in batches during specific periods, with each letter comprising three to four sheets, never interspersed with handmade paper. Leveraging this pattern, we grouped four machine-made sheets together: three were lined using standard double-leaf method, while one was treated using the name card/photograph approach. This ensured each group remained flat without 凸起, preventing unevenness in the final bound volumes. [Figure 1: see original paper]-1 shows a lined name card; [Figure 1: see original paper]-2 shows a lined photograph.

3.2.2 Double-Sided Manuscripts and Postcards

Most manuscripts are single-sided, with few double-sided examples. During his British studies, Lin Songhe sent numerous postcards—not double-sided but with images on one side, thus preserving information on both surfaces. Conventional lining methods that fix manuscripts at four corners would obscure content and

hinder future use.

To display both sides' information, we employed single-side fixation: instead of pasting all four corners, only the right side was fixed, allowing the manuscript to be turned like a page for easy access to verso content.

For a double-sided manuscript measuring 25 × 16 cm, we first prepared a 5 mm-wide xuan paper strip matching the manuscript's height, with similar thickness and whiteness. The strip was fully pasted on its reverse side, positioned, and mounted on the manuscript's left verso edge with a 2.5 mm overlap. The remaining half was adhered to the predetermined lining position. This technique resembles the "mounting with hinge strips" method in scroll mounting, allowing verso content to remain visible through the unfixed side. Note that when Lin Songhe filled the left margin on the verso, leaving no space for mounting, we had to attach the strip wherever blank space was available. Postcards with images on one side and writing on the other were treated similarly, with the image side treated as the recto.

3.2.3 Oversized Manuscripts

During preparation, we established the bound volume dimensions based on the majority of manuscripts to ensure optimal positioning within the thread-bound books, with aesthetically pleasing margins. However, four sheets exceeded 20 cm in width. Altering the book dimensions to accommodate these few would compromise the positioning of most manuscripts.

To resolve this, we partially folded these sheets along their original creases to "reduce" their width to fit the book size. During lining, the cut lining paper matched the folded dimensions. To ensure the folded portion's thickness didn't affect the final binding's flatness, we added single-leaf lining within the double-leaf folios, cutting it to match the folded portion's dimensions. [Figure 2: see original paper] shows a postcard after single-side fixation lining; [Figure 3: see original paper]-1 shows an oversized manuscript before unfolding; [Figure 3: see original paper]-2 shows the same after unfolding.

3.2.4 Irregularly Shaped Manuscripts

Four manuscripts in the collection were irregularly shaped—Lin Songhe recorded his overseas expenses on the backs of calendar pages with non-rectangular forms. Lining these required cutting lining paper to match their unique shapes.

We first traced the contours with needle holes. Since the outlines weren't straight lines that could be handled with utility knives, we used a horseshoe knife. "The horseshoe knife's inner edge is straight while the outer edge has a beveled blade at approximately 45°. Unlike conventional knives with isosceles triangle cross-sections, the horseshoe knife's cross-section is a right triangle. This design significantly improves cutting precision, prevents shifting when trimming thick albums, and produces clean, smooth edges." The horseshoe knife could handle curved lines and special shapes that utility knives could not. [Figure 4: see original paper] shows an irregularly shaped manuscript after lining.

3.2.5 Iron Gall Ink Self-Destruction

While the collection was generally well-preserved, some manuscripts written with iron gall ink exhibited holes and perforations where the ink had deteriorated. Iron gall ink's high acidity causes paper fibers to pulverize. Since no effective method currently exists to halt this acidification, we first mended the damaged areas with xuan paper matching the manuscripts' whiteness and thickness before lining. [Figure 5: see original paper]-1 shows a manuscript with iron gall ink damage; [Figure 5: see original paper]-2 shows a detail view.

3.2.6 Envelopes

The collection includes nine envelopes. Since envelope paper is thicker than most manuscripts and bears writing on the back, direct flattening and lining would affect the final binding's evenness and obscure verso information. We therefore first moistened and removed the sealing paste to fully unfold the envelopes before lining. This adapted the paper thickness to the double-leaf lining while presenting all written information on a single surface. Unfolding envelopes is a common practice in archival preservation. [Figure 6: see original paper] shows a lined envelope.

3.3 Aligning and Pressing Since lining paper lacks printed columns, we used a template matching the book size to pencil two "column lines" at the head and foot before establishing lining positions. After completing one volume's lining, we aligned the leaves according to these pencil marks at the fore-edge. This ensured consistent proportional positioning for all manuscripts within the thread-bound books.

After alignment, the lined manuscripts were placed in a book press for flattening.

3.4 Threading and Trimming Before threading, two protective leaves were added to the front and back of each volume, matching the lining paper in double-leaf format. Using the template and column lines as guides, a paper cutter trimmed excess lining paper from the head, foot, and spine edges.

3.5 Cover and Binding The covers used mounted porcelain-blue silk, requiring the "cover wrapping" method. Six holes were punched for thread binding—standard procedures for thread-bound books requiring no further elaboration.

3.6 Making Protective Cases Dragon-pattern Song brocade and 3 mm deacidified board were used to construct six-sided cases. Measuring five volumes per case, we cut the deacidified board accordingly. Since four cases were required, we ensured the dragon-pattern brocade design maintained overall consistency across all cases.

With these steps completed, the entire manuscript collection's restoration, lining, binding, and case construction were finished. The final product comprised

thread-bound books with porcelain-blue silk covers housed in dragon-pattern six-sided cases.

From a preservation perspective, this method of assembling individual letters into thread-bound volumes through digging and lining both protects each manuscript and preserves its original appearance. Without punching holes for binding, the letters remain sequentially organized, maintaining the integrity and continuity of the donation while presenting aesthetically unified volumes despite their varied formats. Flattening creased manuscripts also facilitates future preservation and use. The thread-bound format with protective cases enables convenient cataloging and retrieval.

From a research value perspective, this restoration and acquisition of Lin Songhe's manuscripts enriches Nankai University Library's collection. The letters reflect social life in Republican-era scholarly families and provide important data on domestic and international price levels for modern Chinese history researchers. As a Nankai alumnus, Lin Songhe's campus life records offer unique historical materials for university history studies.

This restoration project represents the first collaborative task completed by the master and apprentices at Nankai University's Ancient Books Restoration Skills Training Institute. Under the master's guidance, apprentices not only successfully completed the restoration but also significantly improved their technical skills. This represents Nankai University Library's best practice in implementing the National Ancient Books Protection Center's philosophy of "cultivating specialized ancient books protection talents and inheriting and promoting excellent traditional Chinese culture."

(Postscript: This restoration was completed by Wan Qun, Shi Wei, Li Xin, and Guo Kan. After drafting this article, we received corrections and guidance from Master Wan Qun and suggestions from Teacher Hui Qinglou. Our sincere gratitude to them.)

Notes:

Restoration cases on celebrity letters consulted by the authors include: Fu Xiaolan. "Restoration Plans and Techniques for Celebrity Manuscripts—A Case Study of Liu Zanting's Manuscripts at Chongqing Library" *Library Work and Research* (2012); Qu Jie and Mo Zhengchun. "Organization and Restoration of Republican-era Letters—A Case Study of Mr. Chen Zongcai's Letters at Guangxi Zhuang Autonomous Region Library" *Library World* (2014); Shi Wenlan. "Value and Restoration of Precious Letters in Library Collections—A Case Study of Letters to Guizhou Provincial Commander Tian Xingshu" *Library* (2018); Qiu Min. "Protection and Restoration of Celebrity Manuscripts" *Collection & Investment* (2019); Zhao Xinlu. "Research on Celebrity Manuscript Restoration—A Case Study of Xia Shixing's Letters" *Shanxi Archives* (2021).

After graduating in 1926, Nankai University President Zhang Boling recommended Lin Songhe for employment. *Complete Private Archives of Zhang Boling (Volume 1)* records: "Dear Mr. Menghe, I have received your letter to Mr. Zhongshu. The Institute of Social Surveys requires staff. Our university's liberal arts graduate Lin Songhe, excellent in both character and scholarship, is recommended for your consideration. He will present this letter for an interview. Respectfully, Zhang Boling." (Liang Jisheng and Zhang Lanpu, *Complete Private Archives of Zhang Boling (Volume 1)*, China Archives Press, 2009).

During measurement, envelope-type manuscripts were not unfolded. The thickest manuscripts mentioned here exclude envelopes.

Studies on xuan paper properties include: Liu Renqing and Qu Yaoliang. "Preliminary Research on Xuan Paper Durability" *China Paper* (1986); Wang Hui, Wang Rujie, et al. "Comparison of Three Xuan Paper Types: Cotton, Jingpi, and Tejing" *Light and Textile Industry and Technology* (2019); Wang Zhijun. "Selection and Collection of Xuan Paper" *China Cultural Relics News* (2013); Gao Lingling and Zhou Wanpeng. "Research on Dry Heat Aging Properties of Xuan Paper with Different Raw Material Ratios" *Proceedings of the 18th Academic Annual Conference of China Technical Association of Paper Industry* (2018).

Mounting on the left edge ensures the manuscript's turning direction matches that of the bound thread-bound book.

Thread-bound book cover styles include "direct mounting," "wrapped mounting," and "tube mounting." We selected wrapped mounting because the cover material was mounted silk—using tube mounting would cause the silk to damage interior leaves through friction over time, also compromising aesthetics.

References:

[1] [Qing] Sun Congtian. *Essentials of Book Collection* // [Ming] Qi Cheng, et al. *Book Collection Records*. Yangzhou: Guangling Book Society, 2010: 48-49.

[2] Du Weisheng. *Illustrated Techniques of Chinese Ancient Book Restoration and Mounting*. Beijing: Zhonghua Book Company, 2013: 345.

[3] Du Weisheng. *Illustrated Techniques of Chinese Ancient Book Restoration and Mounting*. Beijing: Zhonghua Book Company, 2013: 197.

[4] Wang Zhijun. "Selection and Collection of Xuan Paper" *China Cultural Relics News*, 2013-7-17(7).

[5] Wang Hui, Wang Rujie, et al. "Comparison of Three Xuan Paper Types: Cotton, Jingpi, and Tejing" *Light and Textile Industry and Technology*, 2019, 8(8): 9.

[6] Wang Juhua. *Characteristics and Microscopic Atlas of Chinese Papermaking Fibers*. Beijing: China Light Industry Press, 1996: 135.

[7] Liu Jiazhen. *Water and Cleaning Restoration of Paper Collections*. Beijing: National Library of China Publishing House, 2019: 183.

[8] Chen Ranran. "Production and Use of Traditional Su Mounting Tools" *China Cultural Relics News*, 2014-4-4(7).

Note: Figure translations are in progress. See original paper for figures.