

## Conservation of the Library of Congress' Gandhara Scroll: A Collaborative Process

### ABSTRACT

Buddhism is one of the world's major religions and can trace its origins to 450 BC when its founder, Guatama Buddha, attained enlightenment under the Bodhi tree. Buddhism spread from India, northward, into the Peshawar Valley (present day Northern Pakistan and Afghanistan). The region, Gandhara, stood as a thriving center for Buddhism before spreading eastward along the Silk Roads. Until recently, no original manuscripts had been found documenting the development the Gandharan doctrine of Buddhism. A group of materials dating from the first century BC to the second century BCE were unearthed in the 1990s, and the Library of Congress acquired a birch-bark scroll from this collection. It fell to the Library's Conservation Division to unroll, document, and devise a long-term preservation strategy for this most fragile and ancient object. To accomplish this task, conservators relied upon myriad colleagues and expertise, both inside and outside of its own walls.

### BACKGROUND

The 2008 AIC annual meeting theme of collaboration provided the inspiration to share a project that not only exemplified the theme, but tested, in some ways, a conservator's natural instincts. In 2005, the Library purchased a scroll purported to contain the oldest writing related to Buddhism. The scroll arrived inside a familiar Parker Pen box, lying on a bed of cotton and was obviously a most fragile object (fig. 1). The Gandhara Scroll, as it has come to be called, belongs by genre to a group of materials that were unearthed in the 1990s and are now in the British Library. These thirty scrolls and fragments are the earliest Buddhist texts found to date. They are written in carbon ink on birch bark strips in the Gandharan language in Kharoshti script. They were ritualistically interred in terra cotta jars and buried inside of *stupas*. *Stupas* are Buddhist



Fig. 1. Gandhara Scroll in its original housing

religious structures constructed to hold reliquaries and are the principal architectural and religious elements of the monastic community. Because Kharoshti script died out in the third century BCE, there are only a handful of scholars in the world who can read it today. Until recently, they had to content themselves with inscriptions on coins, statues, and architectural elements. Gandhara is the ancient name for the Peshawar valley in Northern Pakistan and Afghanistan. Although currently this region is tumultuous, between the third century BC and the sixth century BCE it stood as a flourishing seat of civilization, strategically located on the Silk Roads and a thriving center for Buddhism. Its geographic location as a gateway to the Indian subcontinent, and oasis cities of the silk roads in the Tarin Basin, in part explains the wide-ranging influences on the Gandharan culture in ancient times as a crossroads and melting pot. Most of us are familiar with Gandharan art and its melding of Indian and Greek motifs. Buddhism was brought to the Gandharan region by Asoka, the great emperor of the Mauryan dynasty in India and Buddhist patron in the third century BC. By the first and second centuries BCE, Buddhism began to extend into Iran and China with Gandharan monks instrumental in this expansion. Thus, it can be argued that the Gandharan form of Buddhism was particularly influential in the cultural history of Asia due to its strategic location in geography and time.

Presented at the Book and Paper Group session, AIC 36th Annual Meeting, April 21–24, 2008, Denver, Colorado.

Abundant physical evidence of a flourishing Buddhist center can be found in the Gandharan region by the first century BC, in dedicatory inscriptions, sculptures, and coinage. The textual content of Gandharan Buddhist doctrine, however, remained obscure, as no primary texts from this early period had been found—although it was theorized that there must have a rich written tradition. Original manuscripts obviously provide the best source, but since early manuscripts were written on birch bark or palm leaves, neither of which is a stable material, few manuscripts earlier than the seventh century BCE had been found in the Indian subcontinent. The dry climate found along much of the Silk Road is much more conducive to preservation and many early Buddhist manuscripts from the seventh century BCE or later were found and “transferred” to Western cultural institutions by Aurel Stein, et al. The rush to explore long-lost cities along the Silk Road yielded unprecedented, rich discoveries of the thriving civilizations in these now desert climes and further evidence of the Gandharan’s region key position in later Buddhist development. The discovery in the early 1990s of the first and second century BCE scrolls in excavated *stupas* led to a relative explosion in available textual information related to this early period. Akin to the Nag Hammadi and Dead Sea Scrolls, the Kharoshthi scrolls are the earliest known textual material related to Buddhism. Carbon 14 results place most of the material from the first century BCE although the Library’s scroll was dated a bit earlier. Most unfortunately, the region these manuscripts are in is highly unstable. Rory Stewart writes in *The Places In Between*, an account of his epic walk across Afghanistan just after the Taliban fell, of the most amateurish collecting and plundering of ancient sites by villagers. The sad fact that no official excavations are being carried out will obviously result in the loss of more original material, making the rarity of the few manuscripts that do survive even more compelling.

#### DESCRIPTION

Birch bark has a long history of use other than as a writing substrate. Its oils provide protection against biological attack and the bark possesses medicinal qualities as an analgesic. Additionally, birch bark has been used as a building and artifactual material in many cultures since ancient times. Birch is a common and prolific tree, growing abundantly in most temperate zones across the world. The Gandhara Scroll is most likely from Himalayan birch, common to the high altitudes of the area.

Birch bark is one of the three main writing materials of the ancients, along with palm leaf and papyrus. Q. Curtius’s *History of Alexander* notes the use of tree bark as a writing material at the time of Alexander’s invasion of India in 300 BC. Pliny also mentions “the bark of certain trees” being used as a writing material before papyrus in his *Natural History*. The bark is prepared for writing by making two circular incisions

around the trunk several feet apart and wedging the bark away from the vascular cambium. The surface is then oiled and polished to produce an appropriate writing surface. Finally, the sheet is cut to size and stored flat between wooden boards. Strips of birch bark were sometimes sewn together to create larger sheets.

Birch bark is composed of several very thin layers, adhered to one another by pectin, a natural adhesive, as well as by physical knots and streaks. The outer tissues are cork cells, or phellem, composed of suberin, an unsaturated fatty acid that accounts for the cell wall impermeability to water. The cells are laid longitudinally, structurally held together with lentils, spongy areas of cells arranged horizontally that allow for gas exchanges between the inner and outer tissues. The fatty acids between the cell walls, as well as those applied during processing, may naturally exude, creating a whitish material on the surface (fig. 2). This aging process, as well as the lessening of the adhesive strength of the natural pectin, serves to undermine the adhesion between the layers. This is the main conservation problem encountered with manuscripts on birch bark. To find a two thousand-year old sample is truly remarkable given this inherent instability. The scroll’s ritualistic internment into a terra cotta jar and placement into a *stupa* undoubtedly accounts for its survival at all.

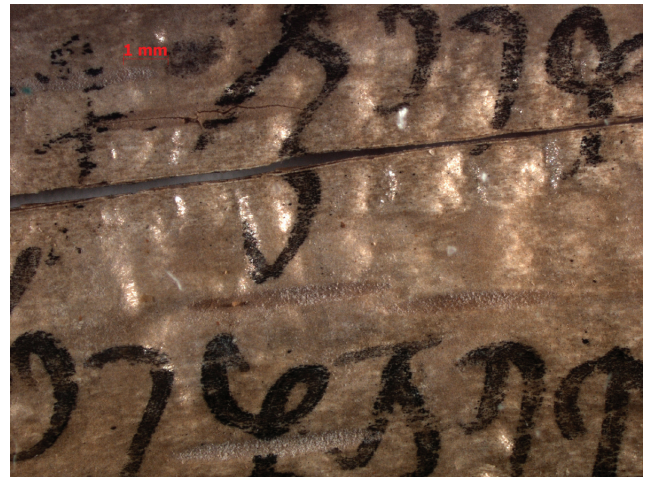


Fig. 2. Photomicrograph showing white exuded material

Published work on the challenges and possible preservation solutions applied to birch bark substrates reflects myriad approaches and materials. Various lacquers and waxes have been employed as consolidants with limited success. A group of birch bark scrolls from Bamiyan brought to the Musée Guimet in Paris was immersed in hot paraffin wax to allow unrolling and consolidation. Research done by O. P. Agrawal and D.G. Suryawanashi at the National Research Library in Lucknow, India revealed that while the natural oils in birch bark make it relatively impervious to water, it is highly

soluble in some organic solvents. Dr. Agrawal details a successful treatment similar to paper splitting wherein individual layers of the bark are separated and pasted back together with a new interleaving Japanese paper. Obviously this is only possible with the most robust of manuscripts.

Various encapsulation methods have been reported, from pasting silk gauze to either side of a manuscript to lamination with cellulose acetate. The Bodleian Library reported on the preservation of the Bakhshali Manuscript by encapsulation between mica sheets and hinging the resultant package onto card stock. The successful conservation of the Gilgit Collection of two thousand birch bark sheets in the National Archives of India using a modified “silking” was reported in 1957. Mylar encapsulation had been recently recommended but would be highly problematic with delaminating, fragile material such as our scroll due to its lack of rigidity and its static charge. Encapsulation between sheets of glass has been the “gold standard” of preservation of ancient manuscripts but there are serious drawbacks with this approach as well. Although lacking the static charge of Mylar, sheets of glass are heavy, presenting difficult handling and storage issues. Additionally, some glass is inherently chemically unstable.

In considering how best to conserve the Gandhara Scroll we had to take into account two main points. The first was the scholarly world’s understandable impatience to have the scroll unrolled and the information it contained preserved and disseminated, particularly cognizant of the unstable political situation. The second was in reconciling the various treatment options with the physical realities of such a fragile and ancient object. The Library’s scroll continues to suffer loss in even the most benign of circumstances. During our initial examination under the microscope a crack was observed spontaneously forming. This early experience undoubtedly shaped our eventual approach. Even if a treatment could be designed to address the fragility and inner-layer cleavage of the birch bark, there remains in the literature much caution regarding the long-term effects of conventional conservation treatments on ethnographic materials. These include adversely affecting the organizational structure with aqueous treatments and removing vital structural and natural inhibitors with solvent treatments. It became increasingly apparent that once the scroll’s secrets were made available, its long-term preservation would be dependent upon environmental and access policies. Our basic treatment strategy was to handle the scroll as little as possible and to ultimately place it between sheets of inert glass (Borofloat) until such time in the future as more options may be available. There still remained the daunting task of physically unrolling the scroll.

#### TREATMENT

As luck would have it, a colleague, senior book conservator Yasmeen Khan, was going to London on business and

agreed to meet with the British Library’s chief conservator, Mark Barnard, who had performed the unrolling of their collection of thirty Kharoshti scrolls. Although she came back from her visit armed with an exact description of the process, we became convinced that our proper role in the unrolling aspect of the treatment would be as “a second pair of hands.” One of the most pivotal pieces of information shaping this decision was the fact that ancient buried cellulosic materials behave and handle substantially different than the cellulosic materials to which we are accustomed. Given the fact that there are precious few buried cellulosic materials around to practice on, it was obvious that a collaborative approach was essential. While the treatment proposal was simple enough—humidify and flatten—we felt that more experienced hands than we could provide were in order and arranged for Mr. Barnard to lead the unrolling.

The pre-treatment examination consisted of simply looking at the scroll with normal and multi-spectral lights with and without magnification. Testing was not carried out since any manipulation resulted in loss. We had to rely on Mr. Barnard’s considerable experience in how the scroll would respond to the gradual humidification and subsequent manipulation. The unrolling necessarily occurs in one session and a primary aim is to handle it as little as possible, so it is vital before beginning that the rolled structure is as completely understood as possible (fig. 3). Some of the British Library scrolls have been concertina-folded and some reverse directions in the middle. Also, to the extent possible, a map of the structure needs be made that mimics the number of rolls, knot holes, and other visible aberrations. This is necessary for the proper initial placement of the roll on the glass and to anticipate difficult areas. In particular, the naturally occurring knot holes present a challenge, as they are structurally hard, surrounded by material with no structural integrity. Prior to



Fig. 3. End view of scroll showing rolled structure



Fig. 4. Unrolling the scroll

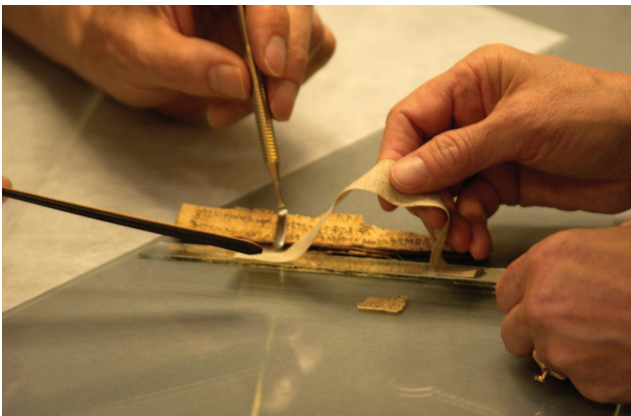


Fig. 5. Setting down the glass weight



Fig. 6. Removing fragments from unrolled section

the actual unrolling, we practiced the entire operation on the paper model, placing it on an extra piece of Borofloat glass. We also practiced unrolling a heavily baked cigar roll. Mr. Barnard felt that was the closest thing he had found to the feel of two thousand year old buried cellulosic material, although the actual scroll was much more fragile. The next step was to humidify the scroll for three days at 80% relative humidity as

this had been found to be a good level to gradually introduce moisture without getting the material too wet. The chamber was a simple 11" x 14" photo-tray, fitted with plastic egg crate and a layer of blotter and Hollytex on top of that. The bottom of the tray was lined with a sheet of rHapid gel and damp blotter that had been pre-conditioned for forty-eight hours.

The actual unrolling needed to proceed without interruption once it was started, so we chose a Saturday to eliminate distraction. An area in the lab with the fewest air currents was selected as our work space since the slightest air movement could cause pieces to be dislodged. We prepared specially fashioned tools that included glass weights to which we attached linen strips on the top to allow for maximum control as they were being set down and bamboo tools slightly narrower than we thought the scroll sections would be. The unrolling began simply enough with the object being placed on one sheet of the glass, centered where we thought the top would eventually be based on our paper model. Using our tools we unfolded each roll (fig. 4). As each section of scroll was unrolled a glass weight was slowly set into place to hold it down (fig. 5). One of the challenges encountered was the difficulty in distinguishing between an actual bark layer and an area of inner layer cleavage within a bark layer. Fragments were taken from the place that they were found within a fold and placed on an identical piece of glass in a location corresponding to where it came from (fig. 6). Over the four-hour process, we occasionally had to introduce moisture via a preservation pencil. The humidity stream was aimed at approximately twenty-four inches above the surface of the scroll to allow for very gradual humidification. Once the scroll was fully unrolled the individual glass weights were carefully removed. Detached fragments that were visible to the naked eye were placed on the second sheet of glass as we removed dust from the edges with a soft brush and aligned the strips as possible. This section of the treatment had to be done swiftly and surely to avoid the edges curling up and fragments being lost. Between the time that the last glass weight was removed and the second sheet of glass laid on top, the scroll was at its most vulnerable. The natural conservation instinct for perfection had to be dampened as fussing to align, unfold, and clean up would result in more loss. Laying down the encapsulating glass had to be done exceedingly slowly to prevent air from being pushed out between the layers (fig. 7).

Once the scroll was unrolled and encapsulated we sealed the edges with Filmoplast p-90. The amount of pressure to exert on the two pieces of glass was, again, a judgment call based on experience (fig. 8). The scroll retains considerable three-dimensional qualities that need to be saved while keeping the scroll in its place on the glass. Attempts at securing previous scrolls to one of the pieces of glass encapsulation have all resulted in further tearing of the birch bark, so the only thing holding our scroll is the weight of the glass and the slight pressure induced by the sealing.



Fig. 7. Laying down encapsulating glass



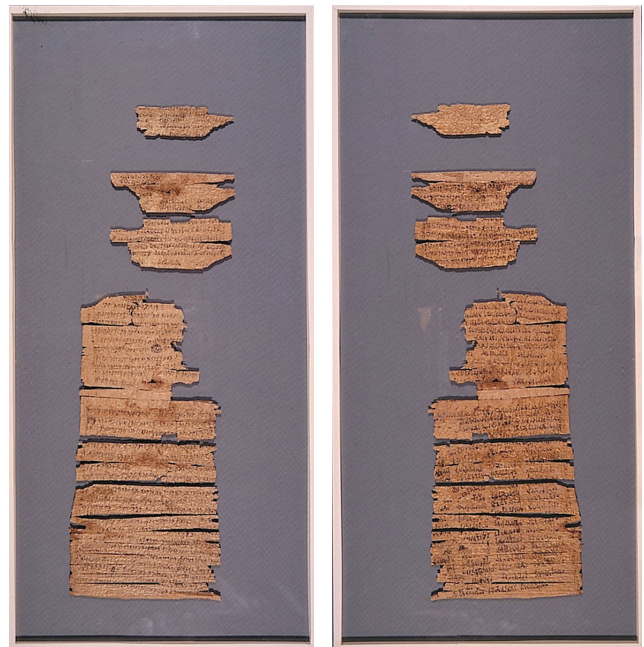
Fig. 8. Sealing with Filmoplast p-90

The secondary housing consists of specially constructed clamshell boxes made by senior book conservator Dan Paterson. We consulted with Mervin Richard, deputy chief of conservation and head of loans and exhibition conservation

at the National Gallery of Art, for strategies to dampen vibration and impact within the box. Based on the dimensions and weight of the encapsulated scroll, the base of the box was fitted with a layer of specially fashioned Volara foam. A drawer is included in the box to hold all the tiny bits (dust) of the scroll that were left. A one-to-one color reproduction of the verso is housed next to the scroll with the intent of discouraging custodians from turning the scroll over. A second box is made to hold the glass-encased fragments. The boxes are housed in the “Top Treasures” vault, ensuring an extra layer of security, environmental stability and access control. The conditions within vault are 50% F and 50% relative humidity.

#### CONCLUSION

It is obvious from this presentation that the Gandhara Scroll was not conserved in the way that we normally think of conserving an object (figs. 9–10). It remains an incredibly fragile item and we had made a decision early in the process to preserve the maximum amount of information, resigned to the fact the every time the piece is handled, it deteriorates a bit. Our strategy for long-term preservation of the scroll itself is to minimize environmental impact and limit handling. During the process, we came to the conclusion that our instincts to address the basic issue of the inherent instability of this material through treatment would not serve us well. Additionally, despite the Library’s large staff and considerable, varied experience, we had to seek outside help. While these ideas are not revolutionary they may be worth repeating.



Figs. 9–10. After treatment, recto (left), verso (right)

## ACKNOWLEDGMENTS

I would like to thank the administrative staff of the Conservation Division—Dianne van der Reyden, Diane Vogt-O'Connor, Maria Nugent, Nancy Lev-Alexander, Elmer Eusman, and Angela Burges—for their support and encouragement throughout the project. Curatorial and historical support is gratefully acknowledged from Allen Thrasher, John Hessler, Richard Solomon, and Mark Allon. I would also like to thank my collaborators, Mark Barnard, Dan Paterson, Adrienne Lundgren, Cyntia Karnes, Merv Richard, and Andrew Robb. A very special thank you and extra helping of karma goes to Yasmeeen Khan, whose substantive and spiritual guidance was essential throughout the entire project.

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## MATERIALS/SUPPLIES

- rHapid Gel sheet  
Art Preservation Services  
[www.apsnyc.com/html/control.html](http://www.apsnyc.com/html/control.html)
- Borofloat Glass  
Swift Glass  
PO Box 879  
Elmira, NY 14902  
607-732-5829
- Volara Foam  
Masterpak  
145 E. 5th Street  
New York, NY 10022  
1-800-922-5522
- Filmoplast p-90  
Talas  
<http://talasonline.com/>
- HOLLY H. KRUEGER  
Senior Paper Conservator  
Library of Congress  
Washington DC  
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