

# Cast Pulp Paper:

## an Alternative for Traditional Repair Materials for Infills in Book and Paper Conservation

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#### Introduction

Conservators are often faced with the task of filling losses that have been caused by mold, insect, or rodent damage. Choosing a repair material can be complicated. Hanji or Washi papers can exhibit physical and aesthetic properties that differ markedly from the original paper and may unsuccessfully match the characteristics of a handmade Western paper. Asian papers can be too strong an infill material and appear too transparent. When areas of loss extend through large sections of a book or through a stack of items, creating individual fills for similarly shaped areas of damage can be both time-consuming and tedious. Yet wet pulp paper is rarely an option when working on bound or water sensitive materials.

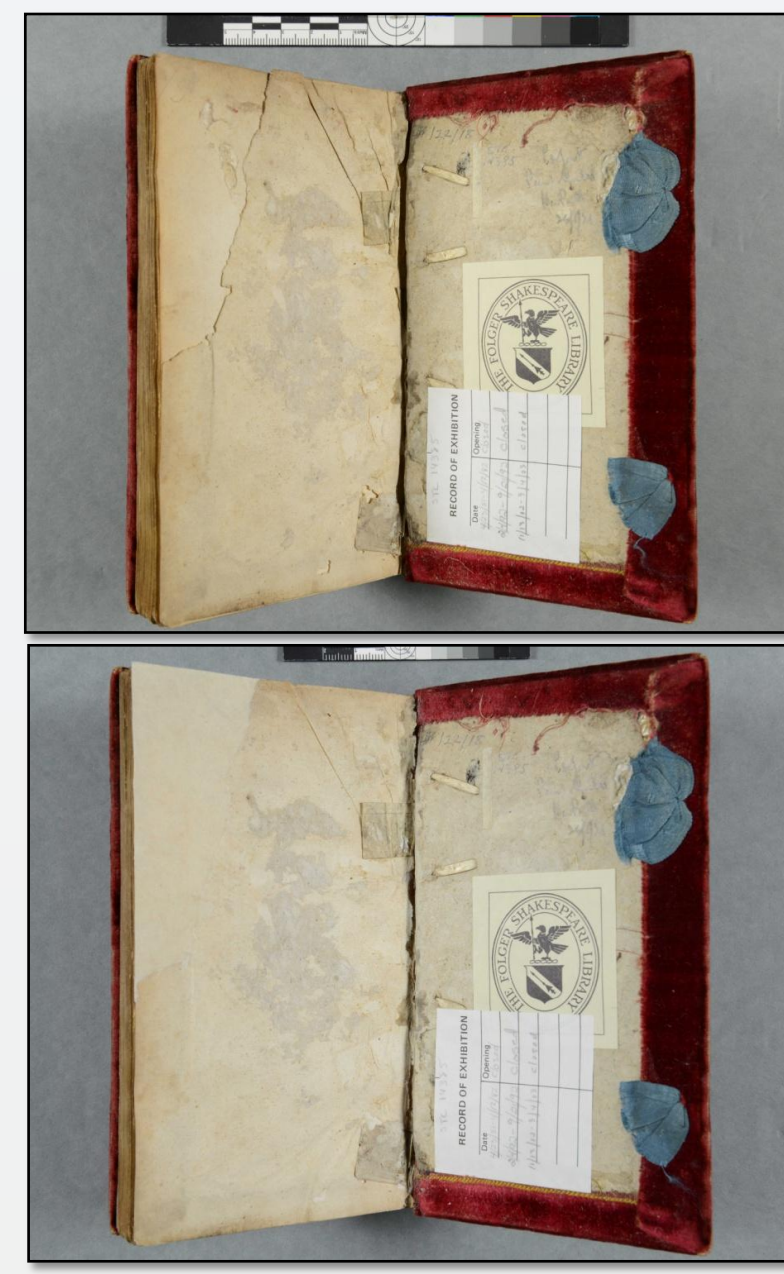
Cast pulp paper can more closely replicate the texture and appearance of many handmade papers, may be cast to fit the shape of an area of loss, and can be made from a variety of a good quality linen and cotton handmade papers.

#### PROS

- Matching the exact thickness of the original without creating a composite layer.
- More suitable for deteriorated and soft paper
- More suitable for wove paper

#### CONS

- Cast pulp paper has shorter fibers and is not strong as Hanji or Washi conservation repair paper
- Takes time to produce.
- Sometimes trial and error experience



Folger Shakespeare Library: STC 14385  
Before and after treatment



Folger Shakespeare Library: Bill Box G2 H33 1834 before and after treatment



#### Preparing Pulp for Casting

Choose a paper that is a close color match for the desired fill. If no single paper provides a good color match, pulp from several different papers can be combined to attain the optimal hue.

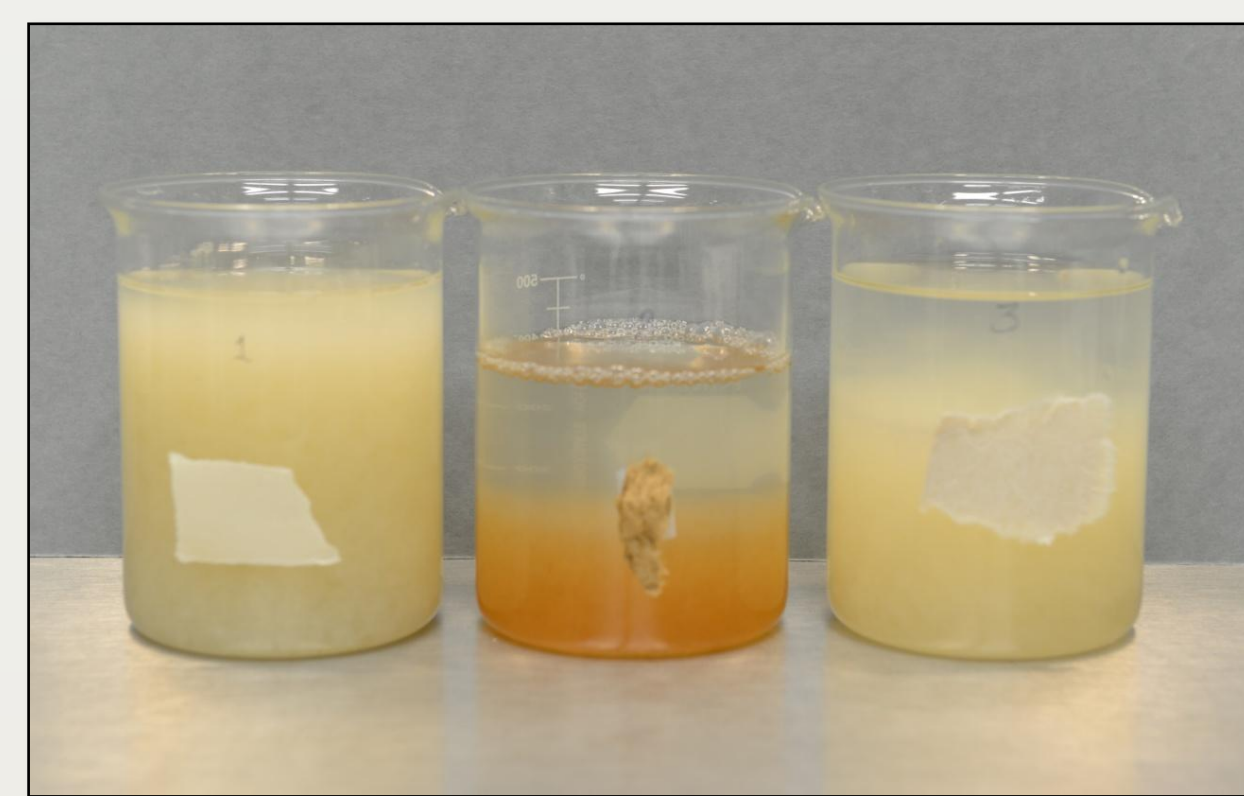
Tear the paper into small (~1cm x 1cm) pieces and soak in hot water, preferably overnight. This helps to swell the fibers and wash out any sizing. If working with several different papers, soak each paper in a separate container.

After soaking, transfer the paper to a blender and add water as needed to create a uniform paper slurry. The blades should be treated so that they are slightly dulled, which will allow the paper fibers to be beaten rather than cut. Blend paper to a homogeneous slurry with no visible large fibers.

Guar gum\* can be added as a formation aid for better fiber distribution.

Calculate how much pulp is needed to achieve the thickness of the infill:

Original, thickness: 0.12 mm Original, loss area: 50cm<sup>2</sup> Sample, thickness made from 20ml: 0.08 Sample, size: 16cm<sup>2</sup>  
1.) 0.12mm x 20ml ÷ 0.08mm = 30ml 2.) 50cm<sup>2</sup> x 30ml ÷ 16cm<sup>2</sup> = **93.75ml slurry needed**



#### Tips:

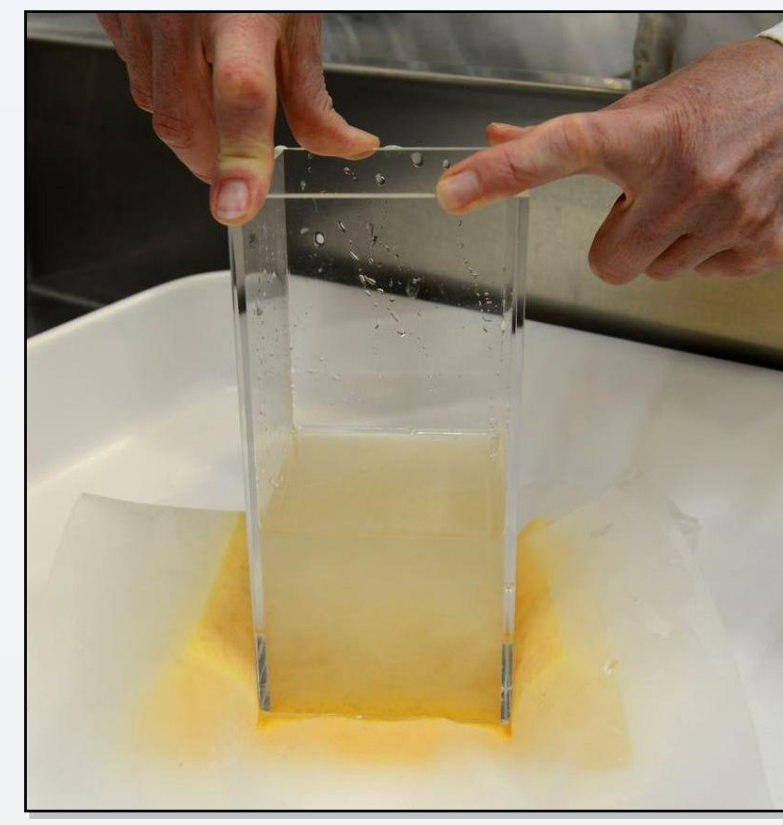
- Cast a number of small samples increasing the amount of paper slurry to get a feel for color and thickness.
- Use a micrometer to measure the thickness of your sample. If the sample is very uneven, fold the sample twice into four layers to get a more averaged and correct measurement of the thickness; divide by four to get the thickness of the sample sheet.
- Don't make the paper slurry too thin. The amount of slurry needed for a heavy paper might not fit into the caster! !
- Add water after measuring the exact amount of slurry, but before casting. Thick slurry doesn't cast even an even sheet of paper.
- Once a sample is made from your paper slurry stock solution and the result is satisfying, DO NOT change its consistency by adding water. Any calculations that have been made will be rendered invalid. Water is only added after the calculated amount is measured.
- It is important to take careful notes and keep track of the amount of pulp in each sample in order to attain reproducible results and avoid disappointment. ☺

\* Guar Gum is a polysaccharide made from the sugars galactose and mannose. It comes from the endosperm of the seed of the legume plant Cymopsis tetragonolobus, and is used as a thickener in cosmetics and the food industry as it has a very high viscosity. It is often used in conservation for leafcasting, pulp filling, and making handmade cast pulp paper. Guar gum acts as a formation aid and is added to the paper pulp for better fiber distribution and suspension to produce a more even pulp. The amount of guar gum to be added to the slurry depends mainly on the type of fibers and the viscosity of the slurry.

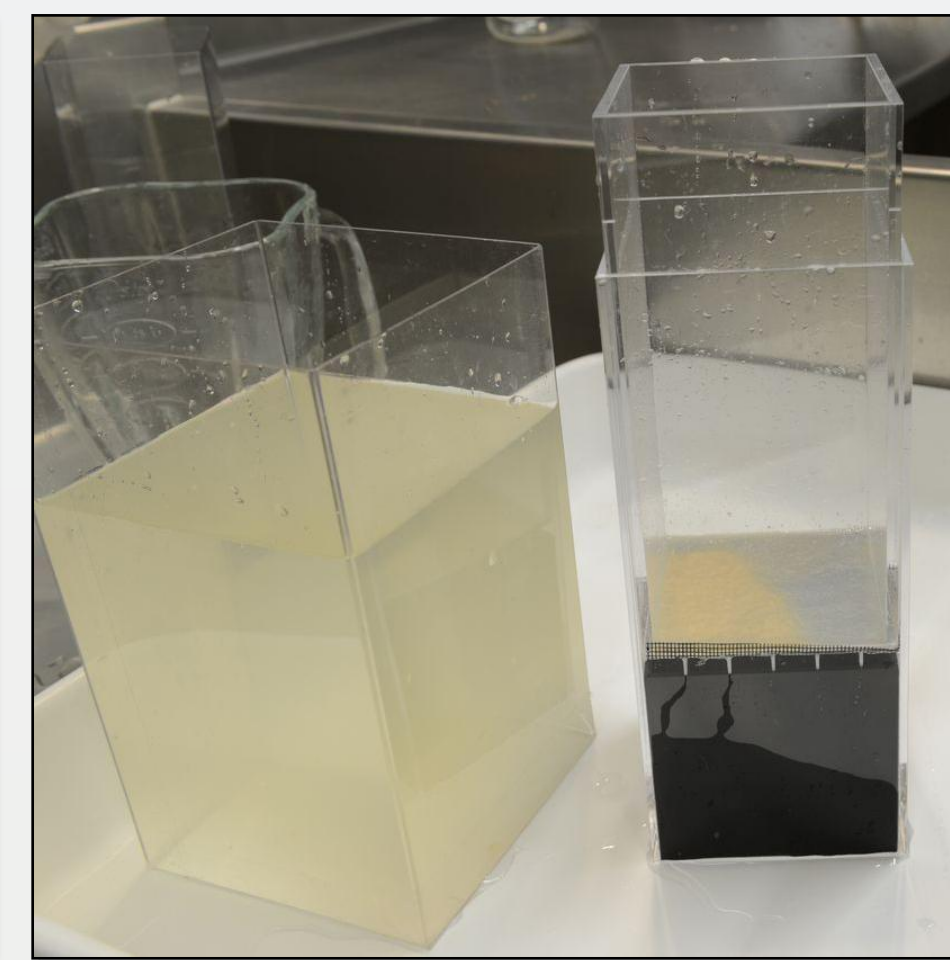
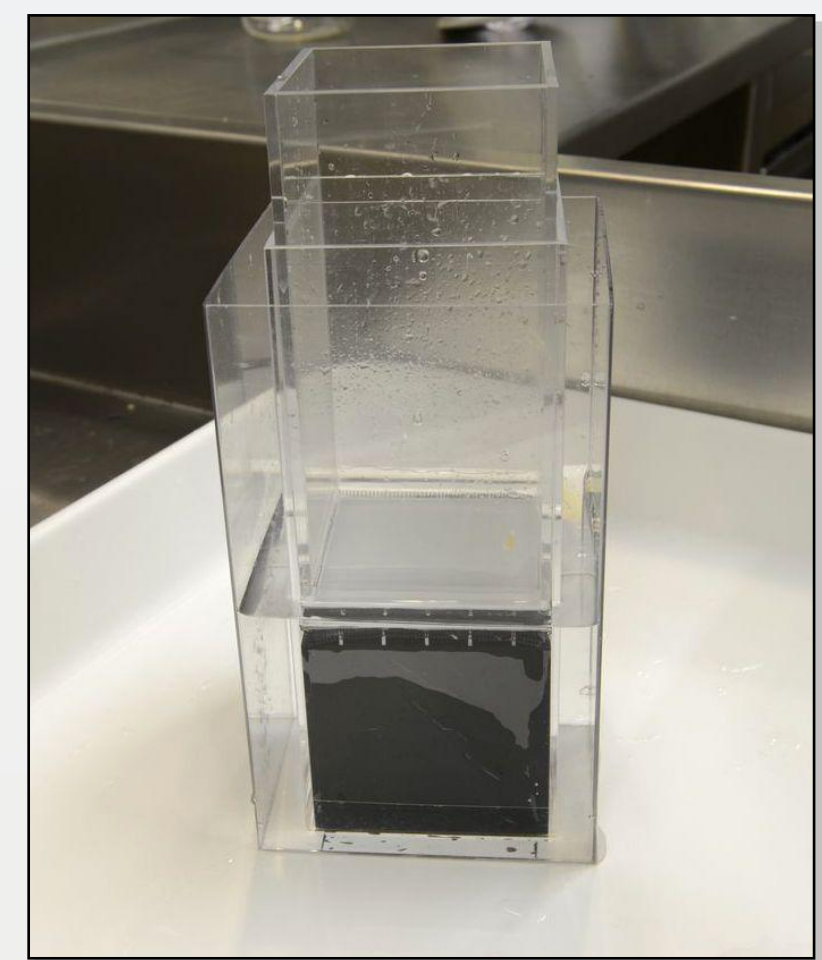
#### Methods of Casting

There are three primary methods for casting small sheets of pulp repair paper: on a sponge, with a petite leafcaster, or on a suction table. Larger sheets of paper can also be produced in a vat with a mould or a deckle-box. These methods are a bit more elaborate and use a larger amount of water.

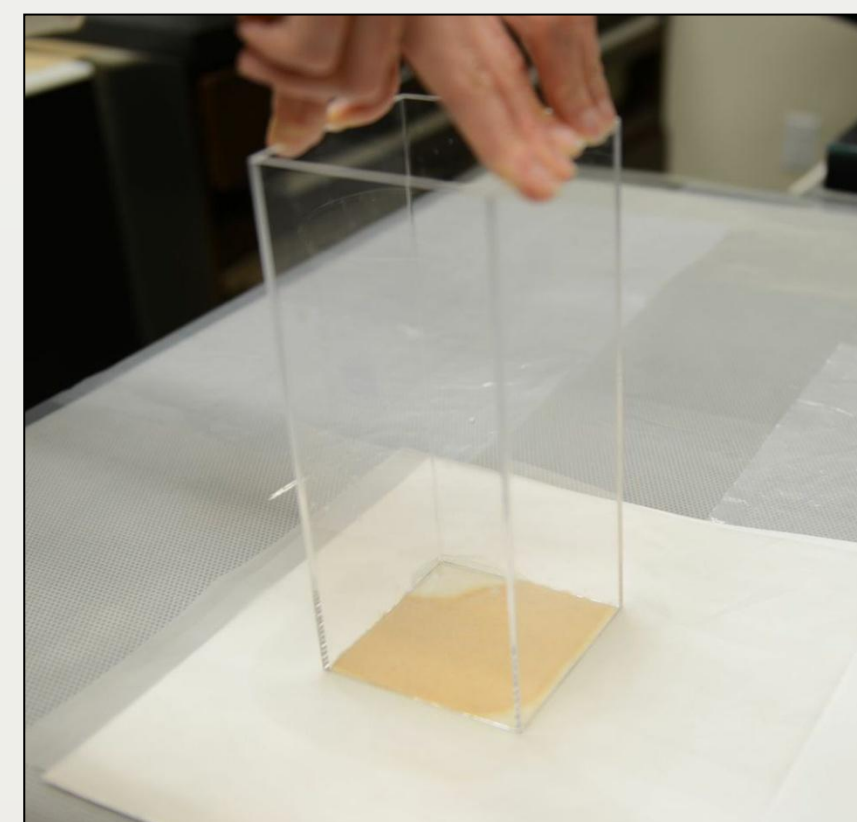
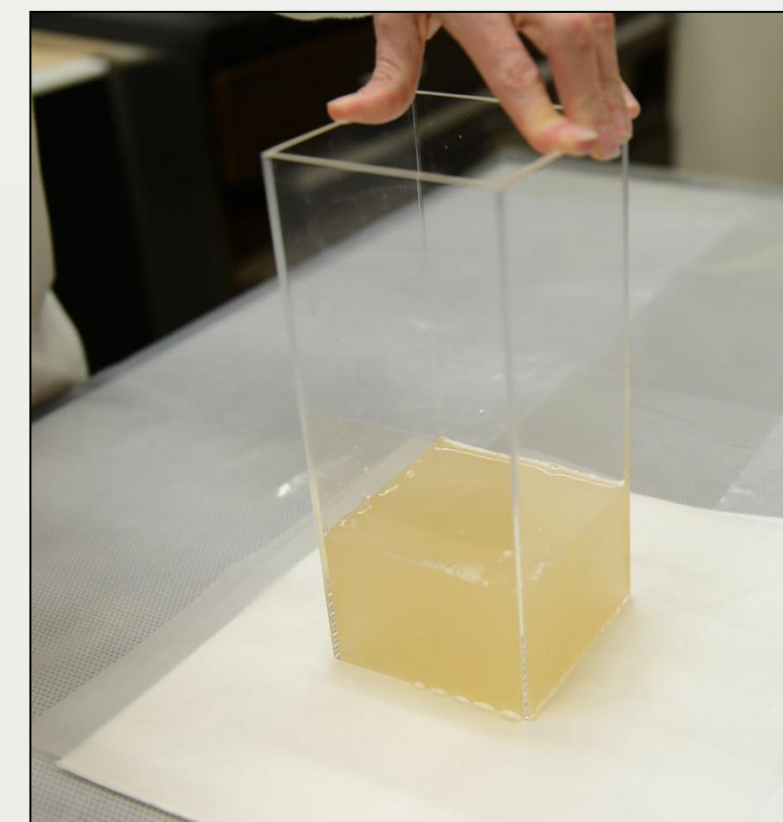
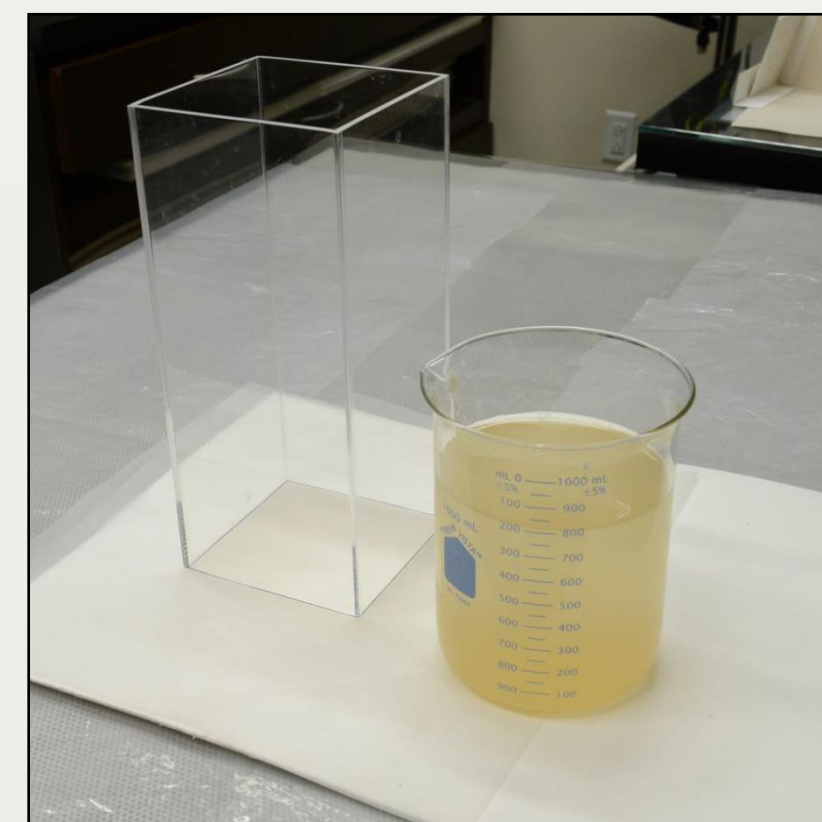
**Sponge:** Place a piece of screen material (spun polyester, silk screen or other) on top of a thick, semi-damp sponge. Use a tall and sturdy plastic container open at both ends, press it firmly and evenly into the sponge and screen material. Quickly pour in the slurry while slowly releasing pressure on the container, allowing the sponge to rise, the water to drain, and the fibers to form a sheet on the screen material.



**Petite Leafcaster:** Two tall, sturdy, square frames, one of which fits closely inside the other, can be made out of Plexi, Vivak/PETG\*, or pre-purchased nesting plastic containers. The outer one has a rim on its inner wall to hold a modified mould. The second one fits tightly in the first and holds down the screens while casting. These two sit in a container that is of the same height as the two frames, and holds the water. The base of the mould is a piece of egg-crate, which supports the screen material. The paper slurry is poured in quickly and the outer cylinder is slowly raised, allowing the water to drain and the fibers to form a sheet on the screen material.



**Suction table:** Mask off a suction table with plastic sheeting, leaving a small open area for casting. Use a tall and sturdy plastic container open at both ends, press down firmly on top of a sheet of screen material and a layer of absorbent material (Tekwipe, blotter). With the suction table off, quickly pour in the pulp slurry. Then turn on the suction table, adjusting the suction as needed to drain the water.



**Screen material:** Any material that will result in the desired appearance of the cast pulp sheet can be used, such as spun polyester, silk screen, or window screen.

**Drying paper after casting:** Allow the sheet of cast pulp paper to dry under pressure between spun polyester and blotter, Tekwipe, or any other material of your choice to achieve a suitable match for the infill. For example, drying the paper on a steel surface will result in a polished and dull finish, whereas a polyester film will create a polished and shiny finish.

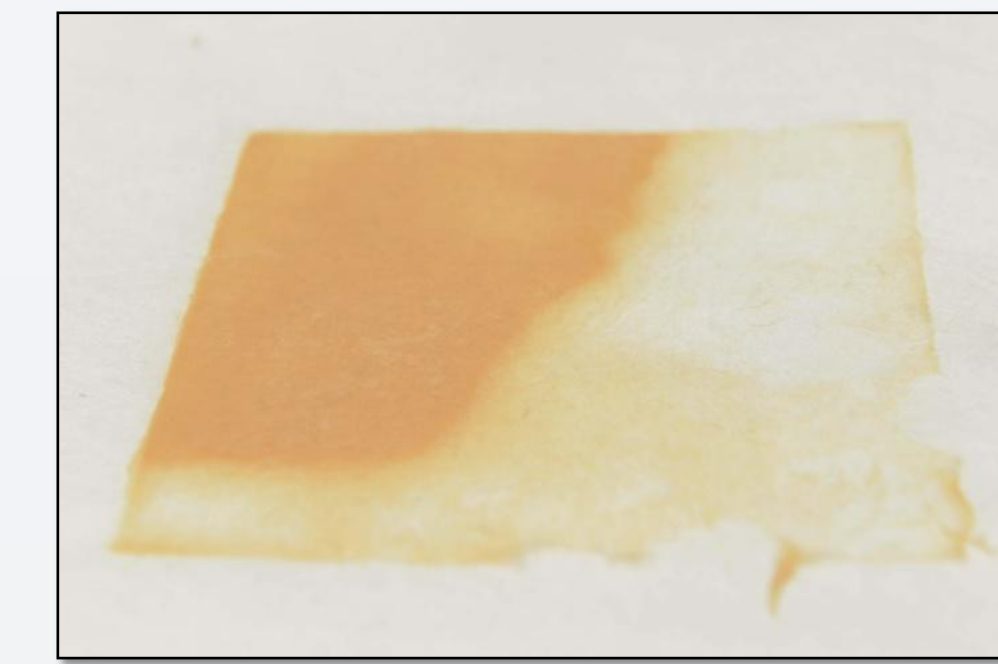
#### Tips:

- When working on a suction table that lacks an option for controlling the suction, leave a corner the plastic sheeting lifted. Slowly lower the plastic sheeting to control the suction.
- When using the sponge or the petite leafcaster, the water can be reused for the next cast.

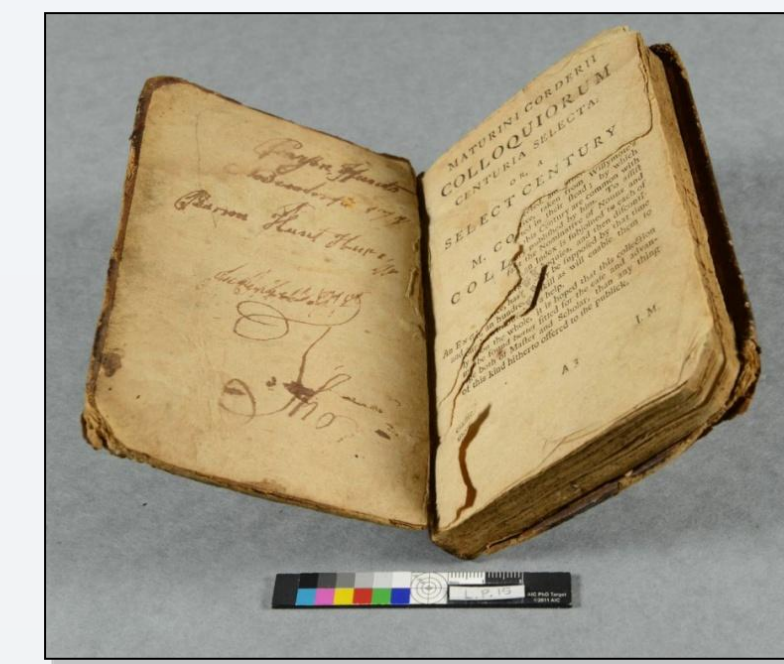
\*PETG, or Polyethylene Terephthalate Glycol-Modified, is a thermoplastic polyester resin.

#### Cast-to-Shape Infills

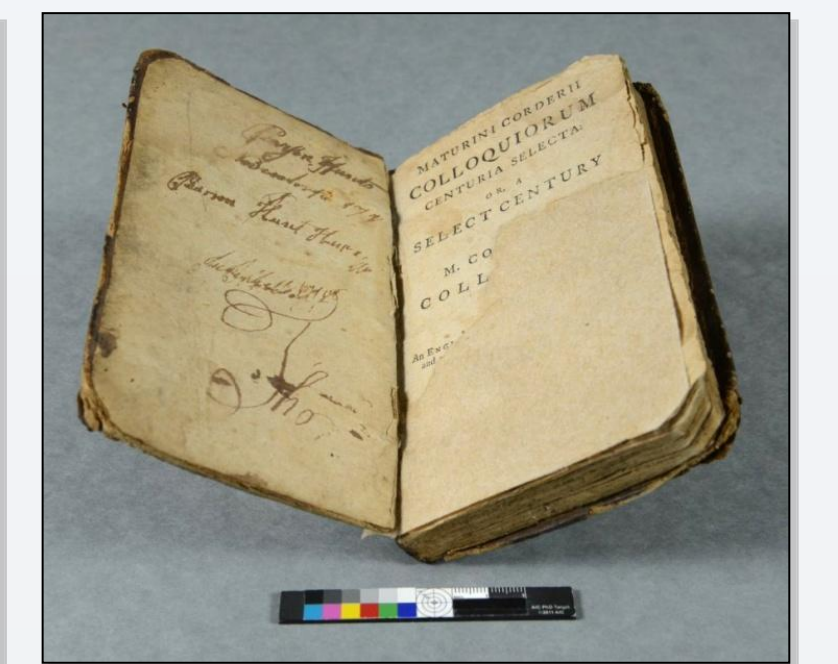
For items with similarly shaped areas of damage, as from mold or insects, infills can be cast to the shape of the loss. Place a piece of clear polyester over the loss and trace its outline with a Sharpie. Cut out the resulting shape, making sure that the remaining area of clear polyester sheet is large enough to allow for extra material extending beyond the loss. Place this layer of clear polyester sheet between the spun polyester and absorbent material when casting; the resultant cast-to-shape paper will conform to the area of loss. The edges are already feathered and require little shaping. If some thinning of the edges is needed, they can easily be pared or sanded down to provide a smooth transition from infill to original material.



Cast-to-shape infill prior to edges being refined

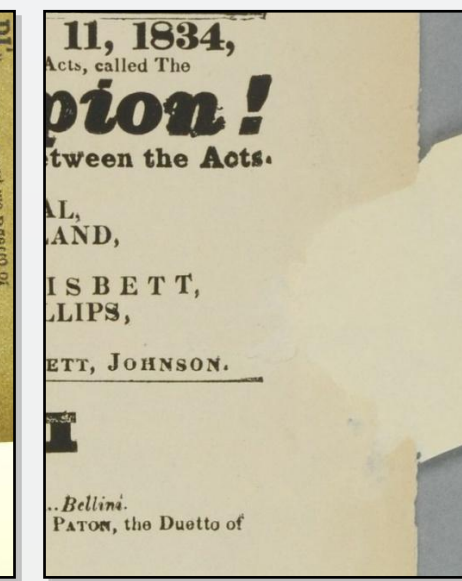
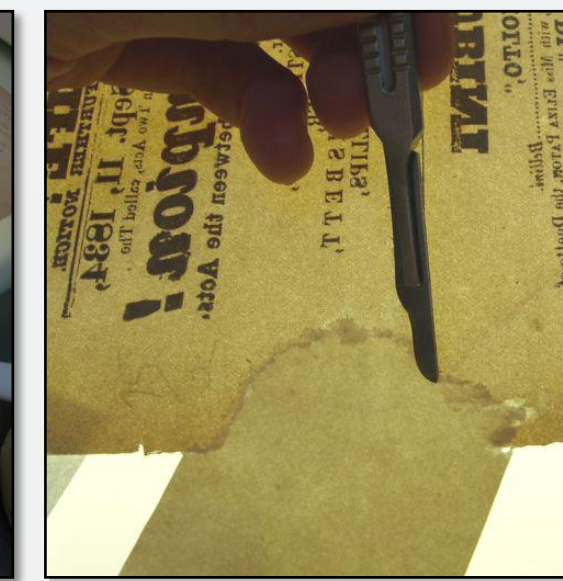
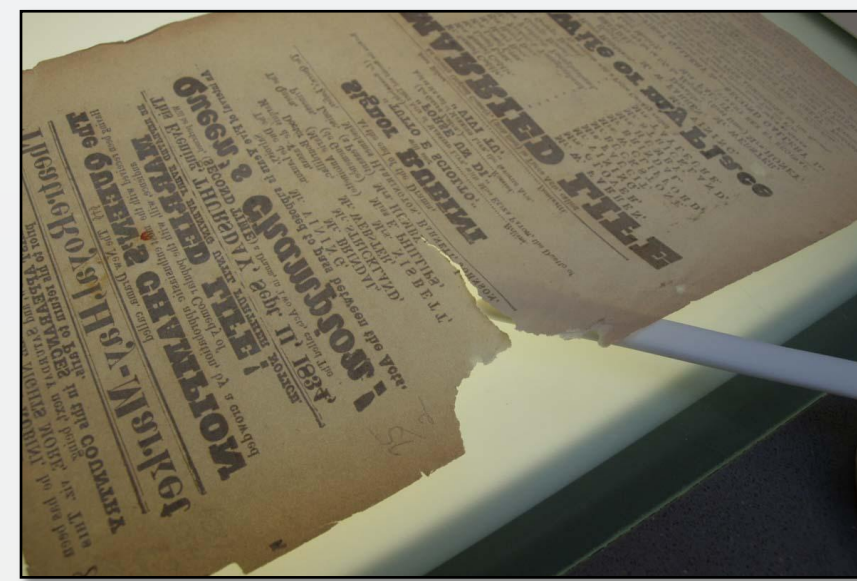


Folger Collection: L.P. 15; title page before and after treatment



#### Traditional Infills and Mends

Cast pulp paper sheets can be easily shaped just like traditional paper infills. The edges can be water-torn and then refined with a sanding stick or pared down with a scalpel. Cast pulp paper is also a great option to mend tears offering a less stiff result.



Folger collection: Bill Box G2 H33 1834; playbill before and during treatment; infill and tear repair

#### Authors



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**Renate Mesmer** is the Head of Conservation at the Folger Shakespeare Library in Washington, DC. Prior to this position, she was the Assistant Head of Conservation. She was also the head of the Book and Paper Conservation Program at Centro del Bel Libro in Ascona, Switzerland, and is a certified master binder.

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Jennifer Evers

Using and producing cast pulp paper is a fun, inexpensive and useful alternative to traditional materials in book and paper conservation. Known side effect: Pulp addiction! ☺

We would like to thank our colleagues for contributing in one way or another to this fun poster by sharing their knowledge, expertise and skills with us. Please contact us if you would like to learn more about Cast Pulp Paper.

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