

## TREATMENT REPORT-mid treatment



**DATE:** August 22, 2022  
**ACCESSION #:** 22.049  
**OWNER'S #:** X893 Sh62

**OWNER:** Columbia University Library  
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**ARTIST/AUTHOR:** Unknown  
**TITLE/DESCRIPTION:** Hidushim 'al ha-Talmud  
**DATE:** Unknown  
**MEDIUM:** Brown manuscript ink (iron gall ink)  
**SUPPORT:** 49 bifolio sheets and eight half-sized sheets of antique laid paper  
**SIZE (H x W):** 7 ¾ x 12 ¼ inches (bifolios)  
7 ¾ x 6 ¼ inches (half)  
**IDENTIFYING MARKS:** On leaf 1 in graphite, "Shitta" and a blindstamp, "Columbia University Library"  
On leaf 2 in graphite, "Broyde 1901". Black stamp ink, "321626"

**DOCUMENTATION:** The condition of the object prior to and following treatment will be documented photographically for the Center's records. Large collections of archival material will be documented with representative leaves/letters/documents.

### CONDITION OF OBJECT UPON RECEIPT

The manuscript was received disbound and collated in graphite by the client. The sheets were kept in their gatherings within paper subfolders. There is blue edge coloring on the top, bottom and fore edge that has entered the sheet up to ¼ inch in places, leaving a darker blue tideline. The edge coloring is not soluble in water or 50:50 water and ethanol.

There was loose and engrained surface grime on the papers. Many of the paper folders had small, gritty particles that may have been a combination of dirt and detached media particles. The particles tested positive for iron (II) ions. The papers had overall mottled brown discoloration that darkened slightly at the edges. There was also strong brown discoloration haloing the manuscript ink; in many instances this had joined to form a continuous rectangle of dark discoloration.

There were scattered small edge folds, tears and losses. Leaves 104 and 106 had larger losses on the bottom fore edge corner. Many of the spine folds were worn, split, or had many losses. There were a few insect holes that penetrated multiple sheets, generally in the margins. Leaf 81 had its conjugate removed and was adhered to leaf 88 along the spine. Leaf 4 was adhered between leaves 3 and 5.

All pages show evidence of iron gall ink deterioration. The severity of the deterioration can be categorized into three sections. The first section, gatherings 1 through 3, have dark haloes and some splitting and dropout. Gatherings 4 through 7 have extreme dark haloes, extensive splits along words or entire lines of text, and significant internal fragments that have detached or been lost due to the splitting. Gatherings 8 through 15 are much less degraded, with almost no splitting visible, but through these gatherings a liquid stain enters the media at the top and upper sides of the text panel that has caused some media bleeding as well as accelerated deterioration in those areas. The joined leaves 105/106 are written with a different hand and ink and do not show signs of iron gall ink deterioration.

All of the inks tested, including marginalia, were positive for corrosive iron (II) ions; most were soluble in water. The inks all appear to be stable in 50:50 water and ethanol. Many of the inks were friable, with tiny particles detaching during testing.

## **TREATMENT**

- Margins were surface cleaned with additive-free polyurethane sponges. Areas with media were not surface cleaned due to friability concerns. Gatherings that were too fragile to open (gatherings 5-7) were also not surface cleaned on the inside to avoid additional damage.
- The gatherings were separated into their individual bifolia and placed between sheets of Hollytex to enable handling during the washing stage.
- The most fragile sections were stabilized with small pieces of remoistenable tissue (Klucel G) to hold loose pieces in place
  - These small repairs would remain on the object and be visible. It was determined that the immediate stabilization necessary for transport into the bath was worth the slight reduction in text visibility. It reduced the risk of detachment and disassociation of fragments.
- The sheets were pre-treated with ethanol, which was applied overall by spraying to minimize mechanical stresses incurred during aqueous treatment and to encourage wetting. All aqueous steps will be performed with the documents supported on Tek Wipe saturated with the treatment solution.
  - Ethanol has weaker cohesive forces holding its molecules together than water (Van der Waals vs. hydrogen bonds), so it can penetrate better. Since inked areas can become more hydrophobic over time, it is important to help evenly penetrate the objects.
  - Ethanol helps minimize expansion which can cause distortion that breaks weakened areas or extends splits.
- Each sheet was washed in calcium phytate in 50:50 water and ethanol to reduce unstable iron (II) ions. The manuscripts were re-tested for the presence of corrosive iron (II) ions using non-bleeding indicator (bathophenanthroline) strips, and the phytate treatment was repeated until the test was negative. Each section received between 2-4 rounds of phytate treatment depending on the presence of iron (II) ions detected.
  - Dilution of the phytate solution with ethanol does reduce the solution strength, so more rounds of treatment were likely necessary than if the solution had not had any ethanol.
  - A calcium-phytate complex can exchange calcium ions for iron (II) ions and form iron-phytate complexes. If iron (II) ions are part of the iron phytate complex they cannot catalyze oxidation anymore.

- These cycles of washing also help with pulling out soluble and acidic discoloration, helping ideally with brightening the paper, improving legibility, and reducing acidity.
- Testing for iron (II) ions was done by removing a representative bifolium from the bath and blotting it somewhat dry before applying a test strip. The test strip dye is sensitive to ethanol and can result in pink staining, so time was taken to allow for any ethanol to volatilize before coming into contact with a test strip.
- Joined leaves 4 and 81 were separated during bathing and adhesive was reduced to the extent possible.
- Additional folds and creases were flattened via gentle mechanical action
- The phytate baths were followed by two rounds of a calcium bicarbonate and ethanol 75:25 bath to reduce soluble acids.
  - The media appeared stable enough to proceed to a less diluted bath.
  - 2 rounds of calcium bicarbonate were performed—until discoloration no longer seemed to be coming off the objects.
  - A calcium bicarbonate bath is thought to neutralize existing acids in the paper and to impart an alkaline reserve to help protect it from future deterioration.
- The leaves were re-sized overall with a dilute 1-2% gelatin solution. The 2% solution was used on gatherings with more extensive deterioration after trials with a 1% solution were found to be insufficient.
  - Sizing paper helps prevent ink migration and is thought to limit future chemical reactions between ink components and the paper support.
- The papers were lined on both sides with a very thin mulberry paper. The text appeared slightly lighter through the lining but remained similarly legible.
- The leaves were transferred to sheets of Tek Wipe to dry underweight overnight
- The objects were humidified and folded into their original section groupings.
- Leaves requiring additional stabilization were guarded with mulberry paper and wheat starch paste. The innermost bifolia were guarded and dried open whereas outer bifolia were guarded as they were folded around their original section to encourage a tighter fit.
- Detached folios that did not have a conjugate were reunited with their original gathering and hinged on.
- The gatherings were dried in blotter stacks underweight.
- Losses, splits, tenting, and tears were bridged and repaired with mulberry paper and wheat starch paste. Stabilizing areas over text was done with very lightweight mulberry paper to limit the obscuring of text.

At the time of this report (and conclusion of Katarina's internship)

- Gatherings 6, 7, 9, 10, 11, 14, 15 were completed and left drying in a labeled stack. These gatherings were representative of the range of stability issues throughout the book and included the most stable and unstable sections. Gathering 6 in particular needed further stabilization with mulberry paper and wsp along some areas of loss.
- Gatherings 1, 4, 12, 13 have been washed but not yet lined and were left drying in a labeled stack
- Gatherings 2, 3, 5, 8 were lined and were left drying in a 3rd labeled stack, ready for folding

**Examination and Report Prepared by Heather Hendry and Katarina Stiller**