

Archival Products

NEWS

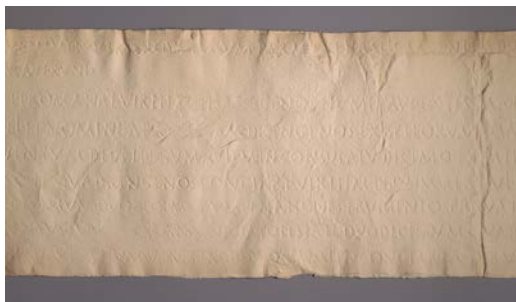
Epigraphic Squeezes: Modern Impressions of Ancient History

By Jill Iacchei and Michele Hamill

IN A LIBRARY'S CONSERVATION lab, tightly rolled photographs, brittle newspapers, weathered maps and heavily soiled and torn architectural drawings are fairly common items to come across a conservator's workbench. The J. R. S. Sterrett collection of epigraphic squeezes (paper cast impressions from inscribed surfaces) recently brought to Cornell Library's conservation lab were anything but typical. The treatment of the squeeze collection provided an excellent opportunity to learn more about the diversity among paper collections.

"Squeezes" & "Squeezing"

"Squeezing" is a method used in the field by archeologists to collect inscriptions from ancient monuments. The "squeeze" is made by laying dampened paper over an incised surface which is then beat with a flat brush and left on the surface to dry. Done carefully, the result is a highly accurate reverse relief of the inscription and a negative right-reading impression of the inscription. This is the most general description of the process. A more colorful depiction and



Brittle epigraphic squeeze from the J. R. S. Sterrett collection that was tightly rolled.

The "squeeze" is made by laying dampened paper over an incised surface which is then beat with a flat brush and left on the surface to dry.



FIG. 29. Quru Bel, Arslan Tash.

The Cornell Expedition making a squeeze in the winter of 1907 at Quru Bel, Arslan Tash (Near East).

The paper should be pulped on the stone and driven into every crack and porosity; using a second and even a third sheet to bind it together...

one more concurrent with the Cornell expedition is given by W. M. F. Petrie in a 1904 edition of *Methods and Aims in Archaeology*. On making paper squeezes he says the following:

“...a tough rag paper without much size should be used; but good newspaper will do. The tougher the paper when wet the better. The stone must be thoroughly cleaned and soaked. The paper is cut to the size, and, if less than the stone, in two or more sheets. A sheet is then put in a basin of water, rolled about to soak, and then gathered into a ball and rolled between the hands to break the grain... and then laid on the stone...gently beaten with a spoke-brush until it is pushed into the hollows...Finally a severe beating is given...as violent as can be done without tearing the paper. The paper should be pulped on the stone and driven into every crack and porosity; using a second and even a third sheet to bind it together... When quite dry and hard the cast may be carefully peeled off.”



Detail of a squeeze showing evidence of the monument's surface texture.

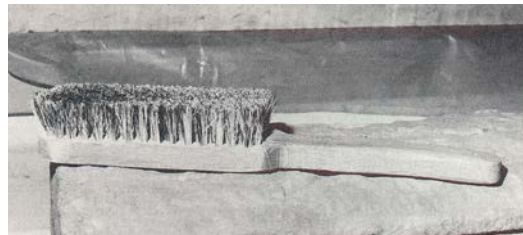
The Value of a Squeeze

Squeezes are a valuable resource to scholars of epigraphy for a number of reasons:

1. Many monuments reside in distant locations; access often requires expensive and time intensive travel. Squeezes are lightweight and portable.
2. The squeeze allows for comparison to and revision of existing interpretations, as well as potential for fragmentary inscriptions to be pieced together. This is especially useful in reconstructing the topography of antiquity. The congruity of a text was often

disrupted in times of conquest or political changes as it was common for monuments to be moved from their original locations and repurposed for building materials. Writing of his own earlier travels in Turkey, Professor Sterrett recounts this practice among the Turks. Sterrett often looked to mosques, fountains, cemeteries and even residencies to track down remains of Latin and Roman inscriptions, oftentimes reoriented upside down or sideways.

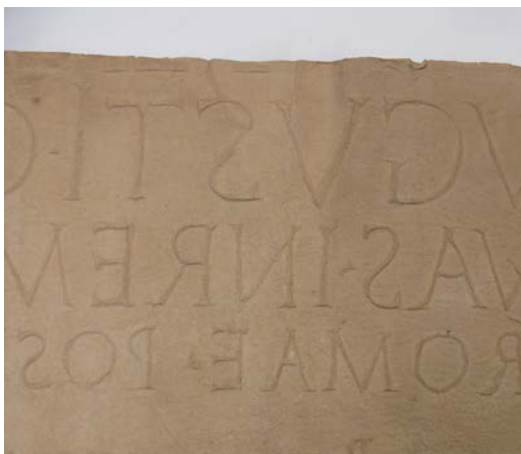
3. Many monuments have given way to time, man and natural disasters. It is likely that they are in poorer condition today than they were at the time the squeeze was collected. Photographs are of value but their accuracy depends heavily upon the light in which they were captured. A squeeze often provides the most complete, accurate, and accessible copy of the text available to date.



An example of the type of brush used to beat the dampened paper into incised surfaces.

The J. R. S. Sterrett Squeezes

This project is part of a larger initiative funded by the Grants Program for Digital Collections in Arts and Sciences to preserve and promote accessibility of library collections for research, study and dissemination. Once cleaned and



During treatment: The right half of this image has been vacuumed, the left has been both vacuumed and sponge cleaned.

stabilized, they will be digitally imaged and reconstructed in 3-D. The grant project opens accessibility to a larger audience through digitization by creating an online resource for scholars of Roman history and epigraphy. Further, these images will be included as part of a comprehensive online resource of the Cornell Collections of Antiquities.

These particular squeezes were collected as part of an archeological expedition to the Assyro-Babylonian Orient organized by Cornell professor J. R. S. Sterrett in 1907.

The 90 that have been selected for treatment at this time were collected from the "Monumentum Ancyranum." Located in Ankara, this monument is inscribed in both Latin and Greek with the *Res Gestae Divi Augusti*, Augustus' account of the most important events of his reign, a text central to the study of Roman history. Following their use by Professor Sterrett in the early 20th century, the squeezes have endured years of neglect and poor storage in the attic of a classroom building on Cornell's campus.

The squeezes arrived to the lab heavily coated with surface soil—dust, dirt and inactive mold. Due to the topographic nature of the squeezes the surface soil is heavily ingrained, especially in the curves and angles of the raised impressions. The squeezes, each measuring approximately 1.5 x 4 feet, are composed of multiple layers of

paper which have begun to delaminate and have become creased with folds from previous storage and handling.

Being unique items and new to our treatment repertoire, these items warranted some initial research. Institutions with similarly sized squeeze collections provided guidance regarding established or accepted treatment methods and storage. Cleaning should be kept at a minimum, only removing the necessary surface soil taking care not to remove any traces of media that may have been on the surface of the monument. Storage options were approached as would be large format documents with raised impressions. Our options ranged from the most basic flat file storage to the more elaborate creation of individual custom sink mats. Considering the quantity of Cornell's collection, limited space and budget, our storage solution gravitated towards the more conservative.

The objective of conservation treatment was to: 1) clean and stabilize the squeezes prior to scanning and digitization and 2) provide a permanent storage solution taking into consideration size, quantity, topographic nature and storage space limitations.

Balancing our research findings and our own judgment, the following treatment was performed:

Cleaning: The expedition accounts note that some of the monuments needed to be cleaned prior to making the paper squeeze, sometimes an exhausting process removing heavily encrusted lime or the remains of the plaster casting process used by a previous German expedition. If there was any pigment on the original monument, it is likely that pigment had already been removed. Our main priority in cleaning was not to make the squeezes pristine, but to remove the loose surface soil that would further deterioration, inhibit the digitization process or be a concern for storage among the university's collections. At the request of the project coordinators, a few of the squeezes were left untreated for future analysis.

Storage options were approached as would be large format documents with raised impressions.

Outside sources reference a range of other materials used in squeeze making: tin, rag paper, acid-free chemist filter paper, cigarette paper, cartridge paper, plaster.

The squeezes were first vacuumed with a NILFISK HEPA vacuum to remove loose surface soil and then cleaned once with Absorene® sponge erasers and again with latex-free cosmetic sponges. The sequence of sponge erasers further reduced the buildup of dirt and dust that had become ingrained in the surface. Remaining surface soil seemed to cling to the nubby and rubbery texture of the Absorene® sponges while the smoother, more flexible foam cosmetic sponges were suited for reaching into the curved and angled areas of the raised impressions.

Stabilization: Epigraphy, the study of epigraphs or inscriptions, takes into account not only the incised impressions but also the surface of the monument on which it is inscribed.



Conducting polarized light microscopy.

The squeezes capture these characteristics showing cracks and dents, as well as areas where the stone was not carved or perhaps smoothed over for correction or reuse. These details lend a great deal of information to the epigraphist looking to piece together the story of earlier times. During treatment, care was taken to preserve these details. Local humidification was used to reduce folds and creases that were not part of the inherent nature of the item's topography. Areas that had

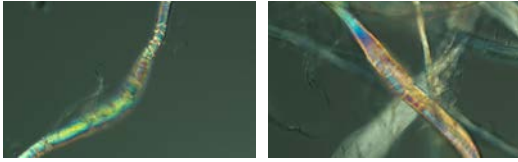
begun to delaminate were generally left alone unless they were at risk of becoming torn or presented potential for loss. In these instances, Japanese tissue and/or wheat starch paste was used to stabilize the area.

Housing: Despite their history of travel, scholarly use and stacked storage, the squeezes have held up remarkably well. Their raised impressions have not been crushed nor have age and deterioration left them brittle overall, rather the squeezes remain quite flexible. The only brittle and fragile areas are located mainly along

the outermost edges away from the inscriptions and in delaminating areas where the strength is confined to single layers, rather than a lamination of two or three. Given this, the squeezes will be protected in archival folders, five to a folder, and safely stored within flat file storage cabinets. This storage solution allows for secure care and handling within the established preservation practices as well as aids in the efficiency of workflow for digitization. Our initial concerns regarding the topography of the squeezes proved unfounded. Treatment observations and handling have proven their resiliency.

Fiber Analysis: While generally consistent in size, thickness, texture and flexibility, there were distinctions among the squeezes. Some had begun to discolor, edges had begun to delaminate and become brittle, while others remained much lighter in color with layers still intact. Publications and websites told of other collections and digitization projects, provided descriptions and even video of how to make a squeeze, but did not dedicate discussion to the type of paper used to make paper squeezes. The available accounts from the expedition refer to the material used to make the squeeze as "squeeze paper." Outside sources reference a range of other materials used in squeeze making: tin, rag paper, acid-free chemist filter paper, cigarette paper, cartridge paper, plaster. What materials were these un-sized squeezes composed of that had given them the qualities that allowed them to withstand the squeeze making process and retain their strength and flexibility for the past 107 years? A materials analysis would provide an answer and a broader understanding of these unique paper artifacts to the research community.

Because each plant fiber has its own unique characteristics, the study of its morphology would reveal the identity of the fibers used to make the squeeze paper used by the Cornell expedition team. Based on the paper's characteristics and qualities of color, texture and flexibility, we hypothesized and tried to



Flax fiber samples from epigraphic squeeze under polarized light at 60X magnification.

anticipate what we might find. The paper had to be composed of a fiber or fibers that were: 1) strong enough to withstand the beating of the squeeze making process, 2) able to retain their strength under application of moisture, 3) able to readily accept an impression, and 4) durable enough to retain their strength. The date of the expedition, 1907, didn't necessarily provide a date or location for the manufacture of the paper but it did provide a cap to the time frame from which to consider fibers and processes used in papermaking history. The paper would have likely been relatively inexpensive (due to the quantity needed) and relatively accessible. Whether the expedition team brought the squeeze paper with them or acquired it on site is not mentioned, leaving the location of manufacture unknown.

Taking into consideration the possible materials used to make paper around the turn of the century, the most plausible candidates were chemical softwood pulp, flax, cotton and/or esparto. Each of these fibers would give the squeezes certain characteristics and qualities. The chemicals and processes associated with wood pulp manufacture could be responsible for the brittle areas and discoloration. Esparto was often added to chemical wood pulp to provide strength. Flax paper is durable and strong as evidenced in early examples of handmade paper from linen rags. Cotton would give a paper that was readily able to accept moisture and take an impression.

However, identifying characteristics of wood, cotton and esparto were not observed. The J. R. S. Sterrett squeezes appear to be composed of bast fibers, most resembling flax. In light of their strength and resilience, this does make sense. The flax fibers would give the squeezes the

qualities that they do possess: flexibility, strength and acceptance of moisture. Daily contact with a variety of paper materials is one of the joys of this profession. Addressing the challenges associated with permanence and durability of paper routinely calls upon previous experience and knowledge of papermaking history. Working with the epigraphic squeezes was no exception. Conservation treatment stabilized these unique artifacts of Cornell University's collection, increased accessibility and contributed to the understanding of both the squeezes' history and their composition.

Many thanks to Cornell Professors Eric Rebillard, Ben Anderson, and Kathie Hodge, Rhea Garen, Digital Photographer, and Walter Rantanen, Fiber Scientist at the Paper Institute, Appleton, WI, and Ted Stanley, Special Collections Paper Conservator, Princeton University.

Jill Iacchei is a Paper Conservation Technician at Cornell University Library. Michele Hamill is the Paper Conservator at Cornell University Library.

REFERENCES

Collings, Thomas and Derek Milner. (1978). The Identification of Oriental Paper-making Fibers. *Journal of the Institute of Paper Conservation*, 3, 51-79.

(1902, February 18). Cornellians to Nearer East: Expedition organized by Professor J. R. S. Sterrett to Asia Minor and Assyro-Babylonian Orient. *The Cornell Daily Sun*. Volume XXVII. No. 103.

(2011, July 25) Digitization Project Brings Ancient near Eastern Inscriptions in to 21st Century. Retrieved from: <http://si-siris.blogspot.com/2011/07/digitization-project-brings-ancient.html>.

(1907, October 16). Exploring Asia Minor An Encouraging Report Received from the Cornell Expedition. *Cornell Alumni News*. Volume X, No. 3.

McBride, Claire. A Pigment Particle and Fiber Atlas for Conservators. The research paper of Getty Post Graduate Fellowship Research Paper, Cornell University, 2002. Retrieved from <https://confluence.cornell.edu/pages/viewpage.action?pageId=215417058>.

McLean, B. H. An introduction to Greek Epigraphy of the Hellenistic and Roman Periods from Alexander the Great Down to the Reign of Constantine (323 B.C.-A.D. 337). Ann Arbor: The University of Michigan Press, 2002.

Meyer, Deborah. Introduction to Fiber Analysis. Handouts from the Winterthur Art Conservation Program, 2013.

Olmstead, A. T., B. B. Charter, and J. E. Wrench. The Cornell Expedition to Asia Minor and the Assyro-Babylonian Orient, Travels and Studies in the Nearer East, Volume 1 Part II: Hittite Inscriptions. Ithaca, NY, 1911.

Petrie, W. M. Flinders. *Methods & Aims in Archaeology*. New York: The MacMillan Company, 1904.

Sterrett, J. R. Stillington. Ph.D. Archaeological Travels in Asia Minor. Austin: The University of Texas, 1889.

Squeeze Imaging Project. Retrieved from http://www.asia.si.edu/research/squeezeproject/sq_making.asp.

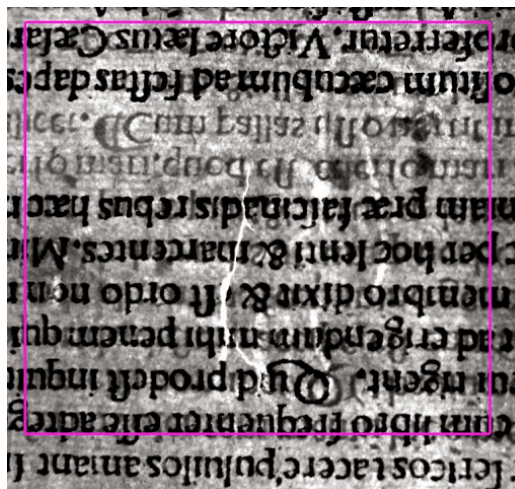
Tracy, Stevens V. (Fall 2010) The IAS Squeeze Collection: What are squeezes and how are they used? Retrieved from <http://www.ias.edu/about/publications/ias-letter/articles/2010-fall/squeezes-tracy>.

La Colomba

By Rachel Lapkin

FIFTEENTH-CENTURY WESTERN European paper is known for its exceptional quality and durability, even as it transitioned from manuscript use to print. Supporting evidence and experience through my career as a book conservator has reinforced this historical teaching, which is why a curator's request to meet about accessing a brittle incunable in Brown University's collection took me by surprise. I thought I had misheard or misinterpreted the conversation. Perhaps the book was a facsimile, it had been rebound and the endpapers were now brittle, or it was a reference work on early printed books in rough shape. However, the book in question was not any of these things. The John Hay Library's 1481 copy of *Opera cum commentario Acronis et Porphyryonis* by Horace (ISTC ih00451000) is indeed brittle, as extreme as most 19th century wood pulp newsprint. In order to recommend a method of use and storage, I needed to understand how this item degraded to such a fragile condition.

Opera was being housed horizontally on its own shelf in a locked cabinet with other special collections materials in an open faced, acidic corrugated board tray slightly larger in length and width, and slightly shallower in depth than the item. Areas of the tray floor, unoccupied by the binding, held shards of dark tan paper, some with partial letter forms. At some point in its life, the book had been rebound in full leather with five raised supports and decorated in a characteristic 18th-century English binding style with a very simple blind tooled double panel design, the inner panel with four corner stamps. Opening the upper cover to reveal the contents, I noted that 95% of the text block had cracked from head to tail and separated from the gathered text block.



Dove watermark, *Opera...*, Brown University. Image enhanced by Lindsay Elgin, Photographer, Digital Technologies, BUL.



Even with foam wedges, a microspatula and deliberate movements it was impossible to turn a page of this book without inflicting new strains on the paper.

William E. Foster, Brown University class of 1873, served as Librarian of the Providence (R.I.) Public Library from 1877–1930. Foster collected 600 volumes of Horace works during his lifetime and his widow donated the collection to Brown after his death. The entry for item number 340 in volume 2 of Foster's c.1928 accession books is cataloged as, "Horace. *Opera*...[?Treviso Michele Manzolo 13 Aug., 1481]... Very rare... Last few leaves stained and wormed and a few leaves have some letters erased." The record continues in detail about the binding: "full levant goat...H. 11 1/2;" the bibliographic description; and one other piece of provenance, "Purchase, from Goodspeed's Book shop, June 7, 1928. No. 426 in Catal No. 13 (1928) of E. Guntrip. Tonbridge, Eng [£8. 10s.]" Although the Tonbridge Historical Society confirmed a bookseller called E. Guntrip

was in business in Tunbridge Wells in 1928, they could offer no other information on secondhand sellers or bookbinders in the area.

Printed in black ink with hand applied initials in blue, red and gold, Brown's 1481 copy of Horace's *Opera* shows insect and severe mold damage to the paper support, as well as instances of opaque, bright white specks throughout, color shifts to the majority of applied pigments, along with faded and mostly illegible marginalia. As already noted, the support itself is severely discolored and does not exhibit chain or laid lines to the naked eye. The binding description and height measurement Foster recorded are consistent with the current binding but the overall condition appears to have dramatically worsened from the accession book account. Its physical state was so far beyond a few problematic leaves and so uncharacteristically poor that I found myself questioning this item's supposed 15th-century Italian inception. Other conservators I approached for an opinion were equally as skeptical. Was this item in fact genuine? How could I attest to its authenticity based on the physical evidence?

Incunabula of the same title from the same region printed during the same year attributed to the same printer may begin life as somewhat uniform printed copies of one another but progress as distinct volumes with unique hand applied initials, decorations and bindings. Ownership, scholarship and environment continue to alter the original form with marginalia, physical manipulation of the object itself and reactions to different storage conditions. In its current state, Brown's 1481 *Opera* is essentially unusable to scholars wishing only to access the text, never mind studying the particular style of the initials or the legacy of notations throughout, all details of potential interest to both the curator and future researchers.

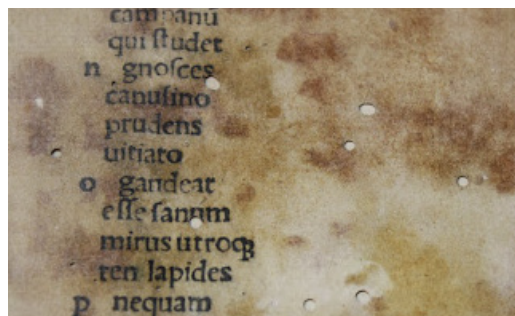
I had to learn more about this puzzling item but circumstances limited both expenses and the amount of time I had to propose

questions, draw conclusions and make recommendations for this book. The initial phase of my inquiry required me to identify my objectives: verify authenticity, explain the extreme brittle state of *Opera's* paper through low or no cost testing, define its current value as a research object and then determine appropriate treatment. Next, I had to formulate my methodology: examine institutional memory and resources, verify status with other library holdings and perform multiple tests identifying paper characteristics.

With no documented treatments in evidence, my ideas for investigations reverted to identifying storage locations since coming to the library; a physical comparison to other institutional holdings of the same imprint as well as products of the same printer or geographical area (perhaps all paper from this region is problematic) identified through the British Library's Incunabula Short Title Catalogue; a combination of paper tests and examinations done in-house and outsourced for chemical data; as well as a literature review on papermaking history and chemistry, historical bleaching, sizing and resizing techniques, authenticity of museum objects, and historical copying techniques. How would my recommendations change if I couldn't prove this copy to be a real incunable and would the book merit enough associative value as a facsimile or forgery to justify preservation?

One of my colleagues first spotted a watermark of a dove, *la colomba*, on one of the brittle leaves. This discovery, documented on a light sheet, along with chain lines and

The binding description and height measurement Foster recorded are consistent with the current binding but the overall condition appears to have dramatically worsened from the accession book account.



Insect and severe mold damage.

I could compare type composition from letter to letter, word to word, line to line for one entire leaf. They all matched.

laid lines I had already seen through the same illumination, gave me something to compare with other copies. The copy at Yale University had exactly the same watermark within its pages, which were in very good condition. In fact, the paper was in very good condition in every library I contacted with the same imprint, including the Free Library of Philadelphia, the Walters Art Museum in Baltimore, Maryland, University of California at Berkeley and the University of Glasgow. Of the 37 copies listed in ISTC, 31 are held in libraries outside of the United States with 13 of those copies in Italy. Librarians and conservators all took the time to describe the binding, write up a general condition overview, provide provenance for their institution's holding or send me an image of one of the only pages I could easily access: the



Embrittled paper.

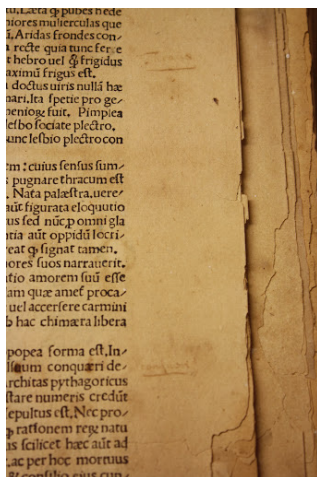
first extant page in Brown's copy, f Aii. With two images from two different copies to scale and Brown's copy in front of me, I could compare type composition from letter to letter, word to word, line to line for one entire leaf. They all matched.

An outsourced lignin test read negative (supporting authenticity) and an XRF reading (also outsourced) required a more long-term follow through. With so many shards of paper, I decided to perform whatever available, low cost, in-house, destructive, "scientific-enough" tests that could provide me any new

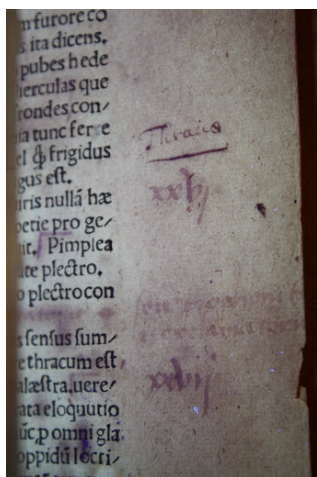
information. I wetted out and weighted down surface test strips on some paper shards and compared them with readings from a control (deionized water) and from Ruscombe Mill's conservation paper. I used both Colorphast® indicator litmus strips as well as commercial strips used for testing swimming pool water. In addition to pH, the swimming pool strips indicated water hardness (expressed as CaCO_3), chlorine, free chlorine, pH and total alkalinity. The pH readings tested consistently low, between 2–3 on *Opera* and consistently higher on the Ruscombe Mill scraps, 6–7. Although I expected these results, they allowed me to examine information from the other readings without presumptions.

Opera had been washed, most likely bleached, possibly resized and rebound before it came to Brown and before Foster's 1928 purchase from the bookseller, probably to rid the copy of marginalia typically disliked by collectors. Analysis of the paper shows that it was exposed to extreme chemical hardness conditions (1000ppm readings from the pool test strips) with water as the medium. Theories concerning those hard water conditions from my literature review indicated possible chemical additions to direct application or immersion bath treatments (bleach, buffers, sizing agents) or even natural hard water washing (with high levels of calcium or magnesium carbonate). Another suggestion of potassium permanganate (KMnO_4), a reductive bleach in existence since the 17th century and in use as a paper bleach since the early 20th century, came from a scientist with personal knowledge of book dealers and their practices. He went on to propose a way that pigment colors may be revived if a test for manganese came out positive. The hard water reading from the pool test strips supports the presence of magnesium on the paper surface.

Without conclusive, scientific data about this paper, I am reluctant to pursue any invasive treatments. I have recommended imaging each fractured leaf for digital access



Without illumination.



With UVA illumination.

and imaging with the aid of UVA to capture washed-out notations and marginalia. Examinations under this lighting revealed at least two hands on one test leaf with the possibility of more throughout. Improving the housing means upgrading materials and overall protection. Although made of acidic board, I felt the open faced tray succeeded as housing on one level. It exposed the book's fragility, indicating that the item could not be held or shelved upright and that it must be transported and accessed with care. I will enclose a new tray made out of alkaline buffered or possibly MicroChamber materials with a transparent lid so the same cautionary signals are communicated. Notes will be added to the housing and the catalog record, indicating condition and parameters for use.

Further questions and research will continue to explore possible explanations for the seriously degraded condition of this item. For now, I have satisfied my objectives for an initially overwhelming project: the copy is, by the available physical evidence, authentic and paper tests and research produced enough plausible possibilities to know that upgraded housing and reformatting are the simplest and most effective conservation efforts at this time. Along with being available to scholars, this particular edition of *Opera* can be used as a teaching tool for conservators that addresses

such topics as materials knowledge, historical practices, treatment decisions, knowing your limitations and engaging your community. I am greatly indebted to the conservators, historians, librarians and scientists who shared information, ideas, impressions and complimentary lab work for this project.

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