
Department of Photograph Conservation Bulletin

March 2024 No. 33



The Fold Endurance of Adhesives

Department News

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Every year, The Metropolitan Museum of Art awards at least fifty fellowships to established or emerging scholars from around the world. The Met’s fellows engage with the Museum’s varied collections to broaden the boundaries of art history, material science, and art conservation. Since 2007, the Department of Photograph Conservation has offered a Research Scholarship in Photograph Conservation. This two-year fellowship gives a conservator access to The Met’s photographic holdings to investigate an under-researched aspect of photograph conservation or preservation. While this fellowship is usually offered to photograph conservators, the 2022–2024 Research Scholar, Catherine E. “Cat” Stephens, is a book and paper conservator with a keen interest in books that contain photographs. The Met is home to more than one thousand photograph albums and photographically illustrated books, which collectively may hold hundreds of thousands of photographs. Cat hopes that her research will assist book conservators in making even more effective repairs to albums, thus promoting the preservation of the photographs they contain.

When photography was invented in the 1830s, photographers immediately began organizing their prints inside books, and creating unique photographic narratives. Albums were one of the earliest and most effective ways to preserve these photographs: a book can provide physical protection to the delicate images, as well as protection from light damage, dust, air pollution, insects, humidity, water, and sometimes fire.

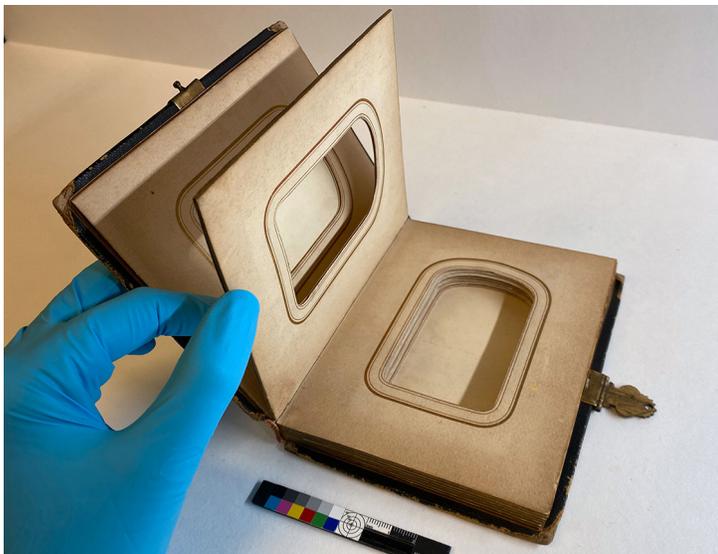
As photographic technology evolved, bookbinders competed to invent new or improved album structures to attractively display the latest photographic formats. Carte de visite (CDV) albums are classic examples of these experimental book structures. Each thick page has a hollow space, hidden by



decorative paper frames, into which two back-to-back CDV photographs can be inserted and locked in place. Unfortunately, the proliferation of photography coincided with the mass-production of cheap, chemically unstable papers and bookbinding materials. For this reason, nineteenth- and twentieth-century books can be very fragile today, especially in areas that must flex, such as the spine, pages, and board hinges. CDV albums can be particularly fragile because their thick, heavy pages are connected by narrow strips of cloth that may or may not be strong enough to support the weight of each page as it turns. Photograph albums can be difficult to repair because their papers are often brittle and quite water-sensitive, meaning there is a higher risk of causing unintentional damage during conservation. Yet books and albums are kinetic objects, and when they enter a museum's collection, they become kinetic artworks. If

an album's spine is broken and can no longer function as it was intended to, the context and narrative of the artwork may be changed.

To repair damaged books, conservators usually reinforce the flexible areas with thin, strong Japanese papers and a conservation-grade adhesive. Traditional bookbinders preferred to use unrefined animal glues or starch pastes. Today, when repairing historical books, conservators often use adhesives like refined wheat starch paste or cellulose ethers, a family of synthetic adhesives derived from cellulose, the primary ingredient in paper. When repairing the flexible parts of a book, some conservators will mix wheat starch paste with purified animal glue or a cellulose ether, for added flexibility, but others believe that this practice is ineffective. Many conservators choose not to take sides



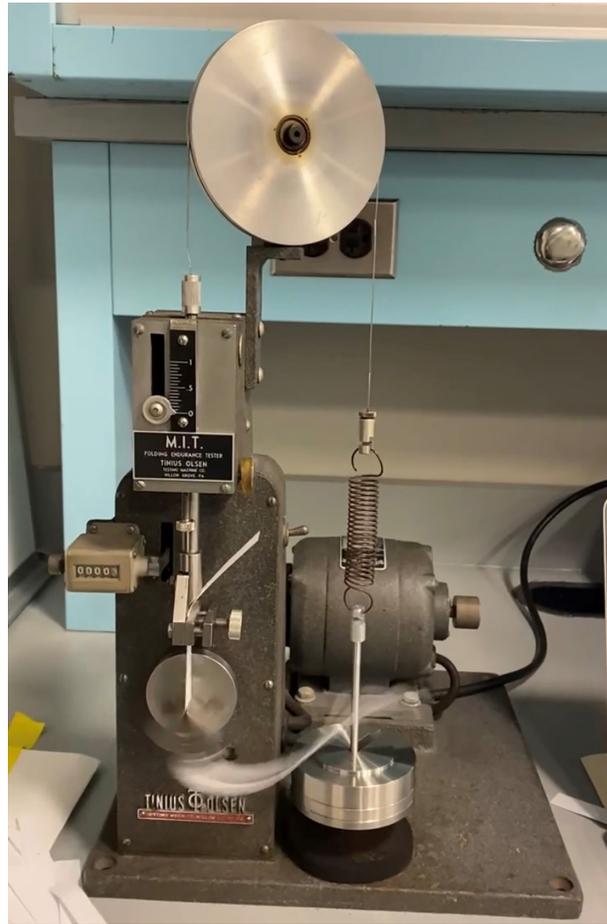
The Fold Endurance of Adhesives

and believe that most conservation-grade adhesives will perform to the same (or very similar) standards, if used properly.

In an attempt to resolve these uncertainties, Cat has designed an experiment that will evaluate the flexibility and fold endurance of different adhesives when they are applied to the same paper. In particular, she will study the effects of mixing two very different adhesives, such as wheat starch paste and protein glue and whether this practice increases the flexibility of the paper/adhesive system, as some conservators believe.

Cat's experiment utilizes a [1970s MIT-style fold-endurance tester](#), (pictured at right) a simple machine that counts the number of times a strip of paper can fold back and forth before breaking. Although this machine does not perfectly replicate the opening/closing motion of a book's spine, it is the closest analog available among materials testing machines in current use. When a 10- to 15-millimeter-wide strip of paper is inserted into the fold endurance machine, one end is clamped between a pair of rotating jaws, which fold the paper back and forth approximately 180 times per minute. As the jaws rotate, a mechanical counting mechanism tallies the number of double folds that the paper has survived. When the paper finally breaks, the electrical connection between the jaws and the counting mechanism is severed, and the machine stops running. The number of double folds is recorded, and the process is repeated as many times as necessary to create a useful data set. Theoretically, when strips of a standard paper are coated with different adhesives, the test results will indicate the relative flexibility or brittleness that each adhesive imparts to the paper. For this experiment, Cat has chosen to use laboratory-grade chromatography paper, which is almost pure cellulose, and does not contain any fillers or coatings. Cat is using two types of chromatography paper: brand-new paper manufactured in 2017, and chromatography paper manufactured prior to 1974, according to its original packaging. Because paper is always changing at the molecular level, this naturally aged paper may behave very differently than the brand-new paper.

To prepare her test samples, Cat cut and numbered over 500 strips of the two chromatography papers, and she randomly assigned them to 11 groups: the "control" group was treated only with deionized water, and the other 10 groups were saturated with a specific adhesive (wheat paste, methyl cellulose, or gelatin), a 1:1:1 mixture, or 6 possible 3:1 mixtures



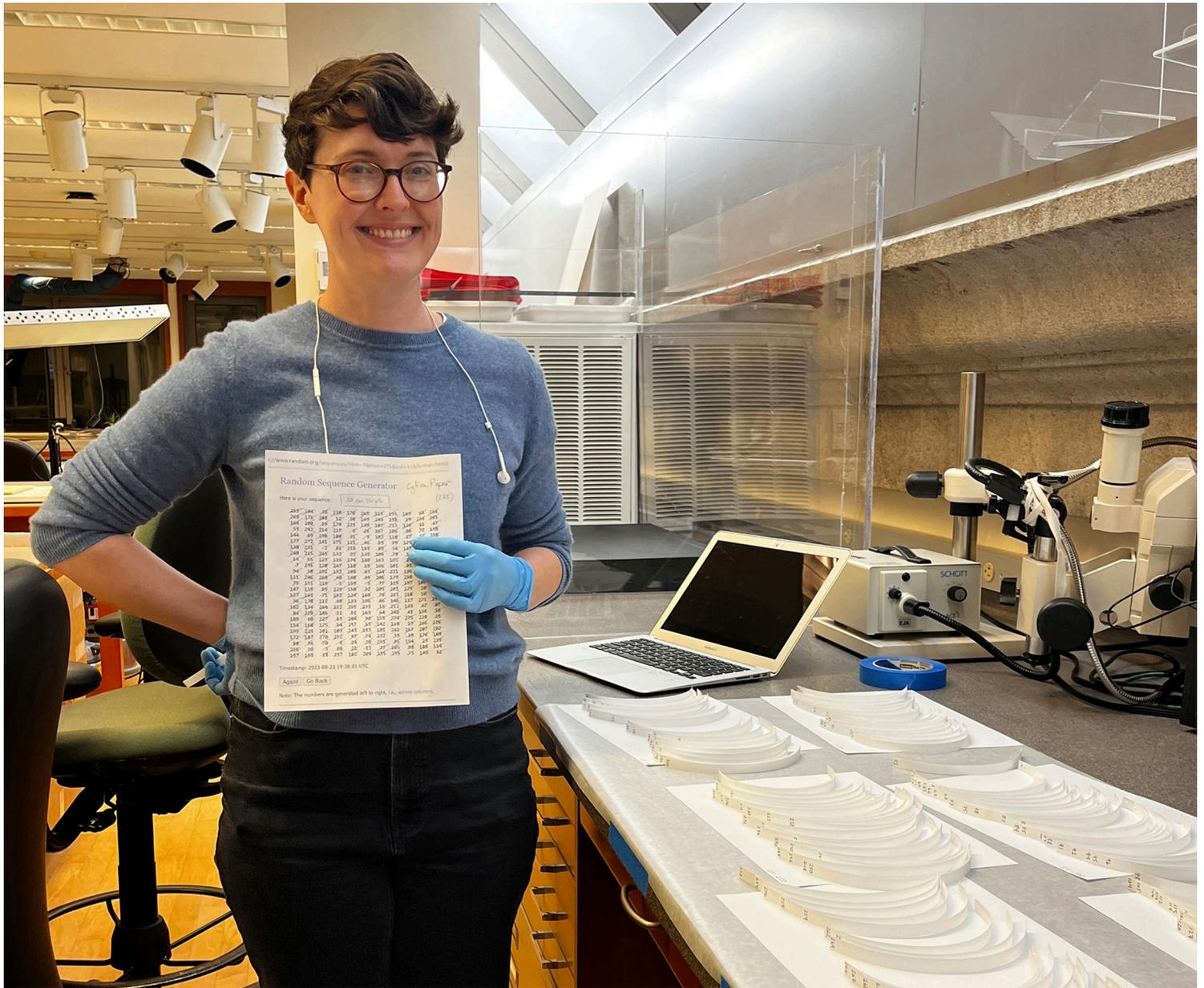
Cover:
Strips of chromatography paper that have been coated with various conservation adhesives for use in Cat's experiment.

Previous page, top:
A damaged carte-de-visite album from the Victorian era. The album's thick, heavy pages are attached together with delicate strips of cloth, which can easily tear away, as the album becomes brittle. (MMA 53.627.1)

Previous page, bottom left:
A carte-de-visite album during treatment. The photographs have been removed, revealing the hollow internal structure of each page. Private collection.

Previous page, bottom right:
Closeup of an album with black pages, from the 1920s. The slightly brittle pages must bend and flex at a sharp angle. Private collection.

Above:
An MIT-style fold endurance machine in action. The rotating jaws bend a strip of paper back and forth until the paper breaks, while a mechanical counter tallies the number of successful double folds.



of these adhesives. The samples were allowed to dry for several weeks, and half of the samples were artificially aged at 90° Celsius, for three weeks. To date, Cat tested nearly all the samples not artificially aged, and she removed the other half from the artificial aging oven. Although the experiment is still in progress, a clear trend is emerging in the data! Cat is looking forward to discussing the results of her adhesive research on May 24, 2024 at 1pm, as part of the [Research Out Loud: Met Fellows Present](#) colloquium. We hope you will join us in person or remotely for this hybrid series of presentations, which will take place between 10am and 3pm on Thursdays and Fridays, May 10 to 24, 2024.

Above:
Cat assigning random numbers to her 550 samples. Each step of her experiment was randomized, to reduce the effects of unintentional variables.

Photos courtesy of Cat Stephens

An Acquisition Process “adjusted to fit”

The Met’s Department of Modern and Contemporary Art recently acquired Louise Lawler’s [Arranged by Donald Marron, Susan Brundage, Cheryl Bishop at Paine Webber Inc., NYC \(adjusted to fit\)](#). Acquiring this artwork presented unique challenges due to its simultaneously being a digital still image file, a photographic image printed on adhesive wall material, and a conceptual piece with variable installation parameters. Jonathan Farbowitz, Natasha Kung, and Felice Graciela Robles collaborated to address the particular issues presented by collecting this type of artwork. Artworks like Lawler’s piece that consist of digital files may require conservators to employ multiple documentation and preservation strategies, as there may not be a singular original object that is the focus of preservation. Appreciating the shortage of existing guidelines, Jonathan and Felice first consulted with other art museums on how they handle condition reporting and storage of digital image files that are part of artworks.

The new acquisition, *Arranged by Donald Marron, Susan Brundage, Cheryl Bishop at Paine Webber Inc., NYC (adjusted to fit)*, represents a long-standing theme in Louise Lawler’s practice. In the early 1980s, she began photographing works of art displayed in museums, galleries, auction houses, and private homes. Her compositions intentionally include the immediate surroundings of her subjects, such as walls, nearby furniture, and adjacent artworks. In doing so, her images put forward the idea that an artwork is informed, and even altered, by the context in which it is shown. This series of photographs depicts artworks by other artists which were arranged and hung by curators, dealers, and other members of the art “establishment.” The works are not referenced explicitly in the title; rather, the roles of power, arbitration, and curation within the art market are highlighted.

Lawler’s own multifaceted role in the art world was foregrounded in the 1982 exhibition, “Arranged by Louise Lawler,” at Metro Pictures where she arranged works by other artists at the gallery. A 1982 artwork already owned by The Met, [Arranged by Donald Marron, Susan Brundage, Cheryl Bishop at Paine Webber, Inc., NYC](#), maintains this focus on the contextualization of works in cultural and institutional settings. It shares a title with the new acquisition yet depicts a different setting in the same investment firm and features a different grouping of artworks.



Photographs such as this were originally produced as editions of gelatin silver prints, to be framed and presented in a traditional format. In the “Adjusted to Fit” series, begun in 2006, Lawler began to play with new physical formats and distortions of her imagery. Photographs from other series and exhibitions were often reiterated as postcards and paperweights. In Postcards produced for ["Paperweights, Postcards, Pictures, Cannibalism", Centre d'Art Contemporain, Geneva](#), a set of postcards depicts silver dye bleach prints recontextualized as crystal paperweights, while [Matchbox for "Fitting" at Metro Pictures, Metro Pictures, New York City](#) shrinks, distorts, and reimagines another photograph. With the “Adjusted to Fit” series, Lawler revisited her 1982 “Arranged” photographs, reprinting them at wall-size on an adhesive vinyl material, much like a billboard advertisement. The digital prints are adjusted (or distorted) to the proportions of the wall chosen for display. Lawler surrenders a degree of agency in this series, allowing the exhibitor to select the wall and amount of distortion that the image undergoes for display. These adjusted-to-fit artworks advocate for the multiple lives of an image over time.

Above:
Jonathan Farbowitz and Natasha Kung examine the artist-provided match print and digital image file in order to write a condition report for the artwork. Photo courtesy of Aleya Lehmann

Many discussions arose during the acquisition process for *Arranged by Donald Marron, Susan Brundage, Cheryl Bishop at Paine Webber Inc., NYC (adjusted to fit)* surrounding the deliverables, (re)printing specifications, and display parameters. We understood that installing this artwork meant using a digital image file to print Lawler’s photograph on an adhesive wall material that would conform to the dimensions of the wall wherever it was displayed. The image would be printed anew each time the work is shown. This dimension of the work raises several questions: What are the characteristics that are essential to the artwork, given that we cannot predict fast-changing printing technologies, or the availability of commercial materials? Are there preferences for the physical appearance of the printed material, including surface sheen or tonal rendering of the image? Is there a preferred substrate onto which the image should be printed? Are there any limitations for selecting the display wall or is this decision fully at the discretion of the curator? Our team compiled these and other questions for the artist and included her answers in the artwork’s digital object record. We also obtained a sample of the commercial adhesive wall material that the artist used in past iterations to better understand the preferred substrate qualities in case this material is no longer available in the future. This open communication between conservators and artist helped us to better understand the work that we would be receiving and her intentions for its presentation. The fact that the artwork is a photograph, combined with the necessity that the digital file is reprinted each time the work is shown meant the team had to implement practices from both photograph and time-based media conservation.

With the incoming acquisition, our department was charged with writing a condition report for the materials delivered, a standard practice. The artwork arrived at The Met as multiple components, a physical match print, and an external hard drive containing the digital image file necessary to print the image on an adhesive wall material. An inventory of the data stored on the hard drive was created as documentation. The file intended for printing is a Tagged Image File Format (TIFF) file. TIFF is typically an uncompressed format used for storing image data and is a [recommended file format by the Library of Congress](#) for long-term storage of still image data thus, ideal for our goal of long-term preservation.

While much research for condition checking digital still image artworks is still necessary and ongoing, we took some preliminary steps to confirm that the technical characteristics of the file were as expected—we visually inspected the file on a color calibrated computer monitor,

and we tested it with file format validation software. The software, in this case, JSTOR/Harvard Object Validation Environment ([JHOVE](#)), analyzes a TIFF file and determines whether it conforms to the published standard for a TIFF image file. The artist-provided file passed the validation process, so we have some degree of assurance of its future sustainability, i.e., the ability to be read by future software that can open TIFF files.

With the condition check successfully completed and the acquisition finalized, digital storage of the TIFF file was the next step. The Met has an existing workflow for ingesting files into its digital artwork storage that was developed through experience with time-based media art, discussed in [Bulletin No. 18](#). After cataloging the physical and digital components, a copy of the file was transferred from the artist-provided hard drive to The Met’s onsite artwork storage and placed within a special archival packaging format. In a few months, copies of the file will then be transferred to our digital preservation vendor and copies will be written to three LTO data tapes as detailed in [Bulletin No. 32](#), leaving us with four copies of the Lawler file in four different geographical locations, a system that helps to secure their longevity. Going forward, a conservator will complete an Iteration Report each time the work is displayed to record the decisions made for each instance of exhibition. The report will include where the image was placed in the exhibition, which printing process, inks, and adhesive wall materials were used, and who was involved in making the decisions, including artist, curator, conservator, or others. This documentation can help model future iterations and frame discussion on the boundaries of this artwork’s variable nature. Iteration Reports are typically part of the time-based media documentation model as discussed in [Bulletin No. 24](#).

This acquisition required the methodologies and theoretical frameworks applicable to both photographs and time-based media. We expect that The Met will continue to acquire more photographs that arrive as digital image files, and we must be prepared to handle these kinds of works. Continued research is needed in this area to develop better practices and workflows, not just for The Met but for collecting institutions across the world.

Photographic Paper Sample Books

As any analog photographer working today can tell you, photographic papers are hard to come by. Not so during the late nineteenth and early twentieth centuries, when literally hundreds of photographic papers were produced in the US, Europe, and other parts of the globe for amateur and professional markets.

The Department of Photograph Conservation is the repository for a growing number of examples of these early photographic papers, which serve as essential research materials and help us learn about artworks in our collection. These include examples produced by Eastman Kodak, Bayer, Agfa, and As de Trefle, among other manufacturers, showcasing black-and-white gelatin silver papers, the dominant process in the first half of the twentieth century. Some sample books include commissioned portraits or landscapes to demonstrate the various qualities of the papers. In other instances, small paper samples were presented in a grid, making comparisons straightforward, like in the DuPont sample paper book, ca. 1957, pictured at right.

Many photographers intentionally selected papers that complemented their aesthetic preferences and helped them realize their artistic goals. They understood that the paper choice itself played a significant part in the photograph's final appearance and utilized different paper textures to achieve different results. Smoother papers may have been chosen for images intended for reproduction, while rougher-surfaced papers might have been preferred for expressive compositions.

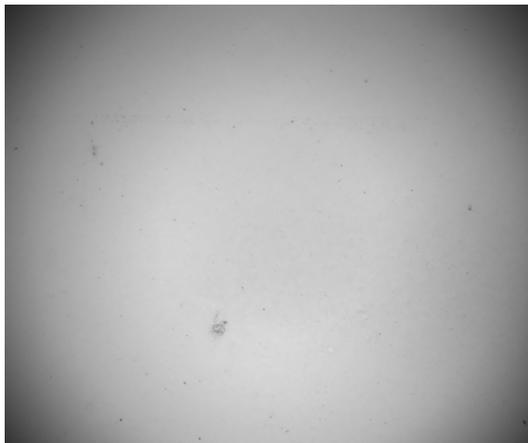
Paper manufacturers varied characteristics such as texture, color, thickness, and sheen to make a wide variety of products that suited the market's needs. The increasing demand for photographs during this period drove market growth and competition in these areas. In learning which papers were available during different time periods, photograph conservators and historians can better understand aesthetic trends in the medium, in addition to gaining insight into a photographer's practice and aesthetic preferences.

While finding a perfect match between one of these paper samples and a work of art in the collection is nearly impossible, comparing characteristics such as surface



texture, color, gloss and dimensions can lead to families of related paper types and can reveal trends in an artist's use of papers. To compare surfaces, an instrument called a "texturescope" is used to produce raking light photomicrographs of the paper surface, producing a topographic view of the photograph's surface. The oblique angle of the light in this setup reveals texture by emphasizing the highlights and shadows of the paper surface. A smoother paper would have less contrast between the highest and lowest points of the surface (see Fig 1, smoother paper), while a more textured paper would have more contrast between the two (see Fig 4, rougher paper). These photomicrographs provide a visual archive with which to judge and classify paper surfaces. Applying an algorithm to these image files allows for even more detailed analysis of the texture of each paper beyond what we can discern with the eye alone, making the texturescope a powerful tool for close comparison.

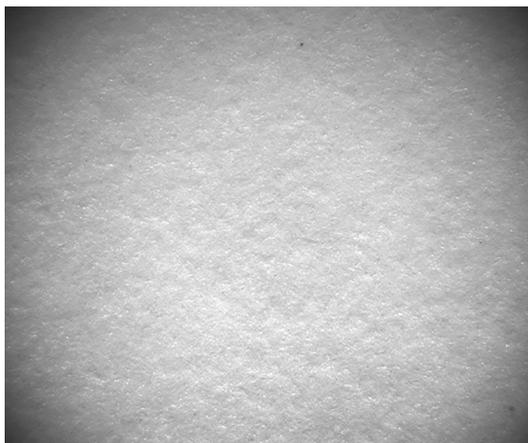
Recently, our Conservation Apprentice, Michaela Lott, accessed these photo paper samples to practice using the texturescope for an upcoming research project related to the [James Van Der Zee Archive](#). Since starting the project, Michaela has handled hundreds of prints and noted the wide variety of photographic papers used by the artist. As the product of a career that spanned over sixty years, the collection presents the perfect opportunity to conduct a photo paper characterization survey. Studying the sample books will help Michaela become more familiar with the subtleties of photo paper characteristics and inform how



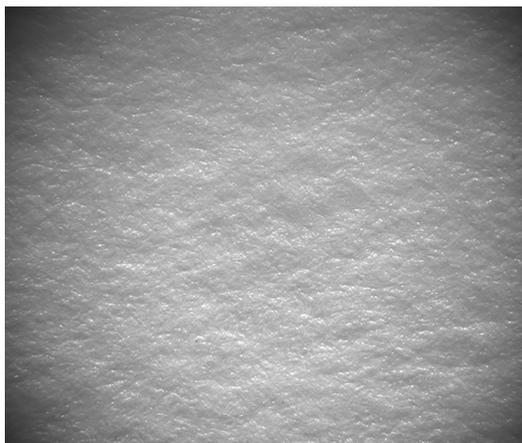
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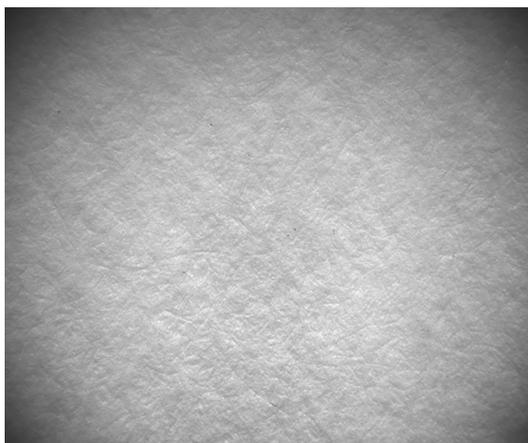
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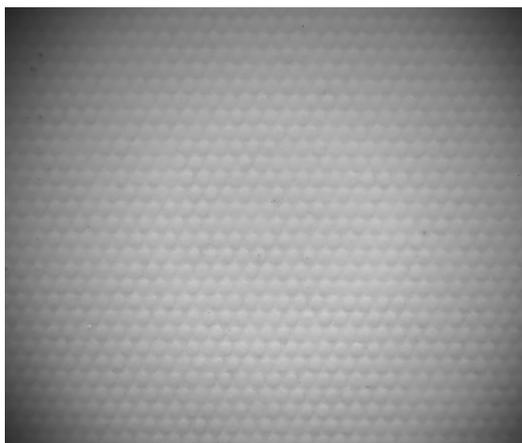
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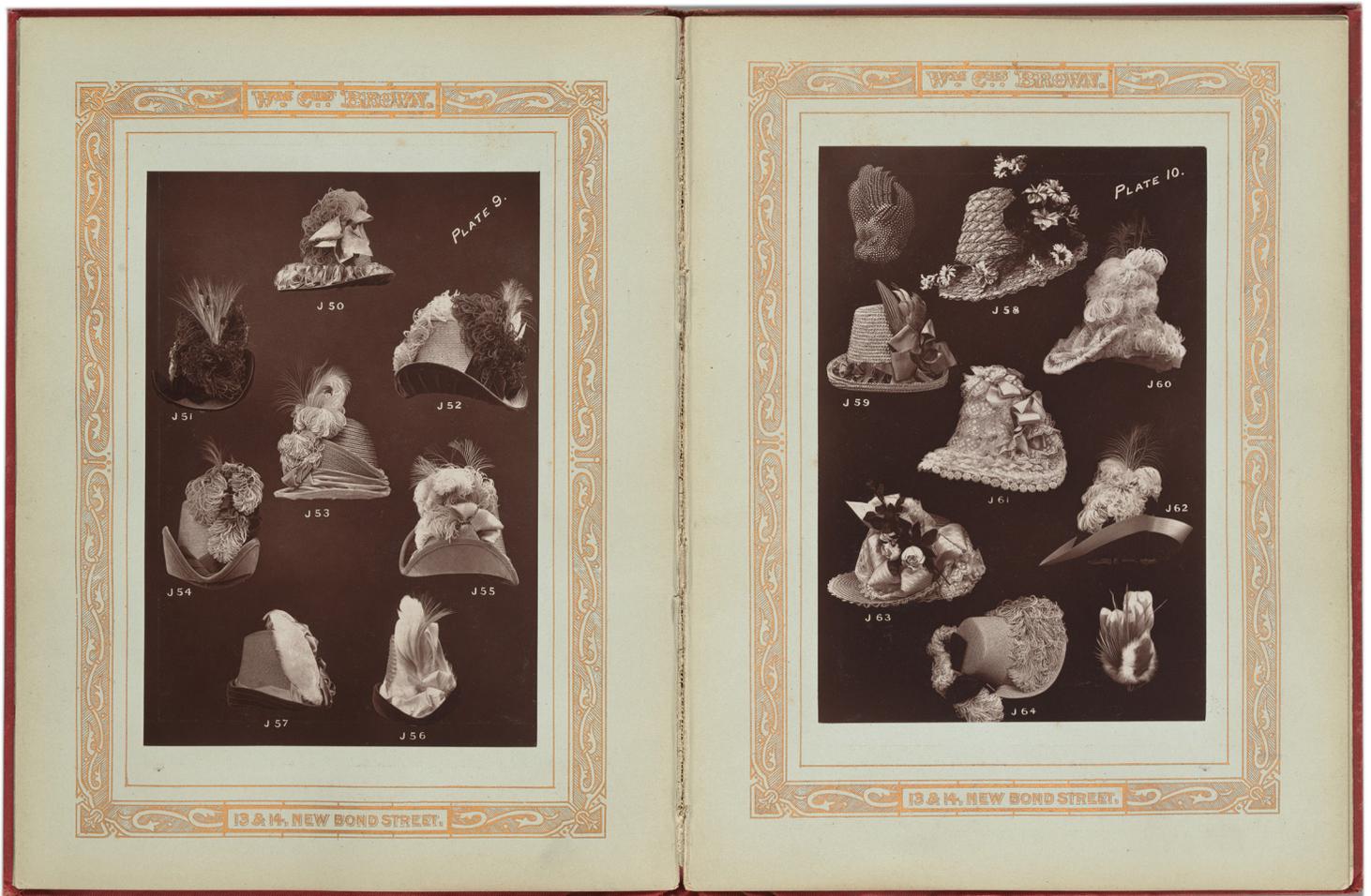
6

Texturescope images of samples contained in the DuPont Photographic Papers (1957) sample book, pictured on previous page.

The chart accompanying the samples designates them as follows: 1) white glossy on single weight paper; 2) white semi-matt on document weight paper; 3) natural white rough luster on double weight paper; 4) cream super rough luster on double weight paper; 5) white rough matt on medium weight paper; 6) cream white silk on double weight paper.

Photos courtesy of Michaela Lott

Exhibitions



Current Exhibitions

Before Yesterday We Could Fly: An Afrofuturist Period Room
Ongoing

Don't Forget to Call Your Mother
December 18, 2023 through September 15, 2024

Afterlives: Contemporary Art in the Byzantine Crypt
January 29, 2024 through January 25, 2026

The Harlem Renaissance and Transatlantic Modernism
February 25 through July 28, 2024

The Real Thing: Unpackaging Product Photography
March 11 through August 4, 2024

Upcoming Exhibitions

Ink and Ivory: Drawings and Photographs Selected with James Ivory
July 29, 2024 through May 4, 2025

Location

The Met Fifth Avenue
Sunday–Tuesday and Thursday:
10 am–5 pm
Friday and Saturday: 10 am–9 pm
Closed Wednesday

The Met Cloisters
Thursday–Tuesday: 10 am–5 pm
Closed Wednesday

Date Night at The Met Fifth Avenue!
Fridays and Saturdays 'til 9 pm
Friday and Saturday evenings are made possible by the Ruth Lapham Lloyd Trust and the William H. Kearns Foundation.

Above:

Unknown British maker, *Fashions 1837–1887*, by William Charles Brown, 1888. Woodburytypes. The Metropolitan Museum of Art, New York, Joyce F. Menschel Photography Library Fund, 2011.190 [1–4]

In the back of this catalogue from Queen Victoria's milliner, a disclaimer confirms that no British songbirds were sacrificed for its production. Nevertheless, a flock of hats in fine feather fills this page spread, flaunting designs fit for the royal family. The deluxe volume is illustrated with woodburytypes, an early photomechanical process with a rich tonal range to register varied velvets, silks, straws, and plumes. Hatstands and supports have been edited out of these images to suspend the specimens midair. Surreal to modern eyes, the effect accentuates the hats' commodity status and implies inventory soaring out of stock.

On view in *The Real Thing: Unpackaging Product Photography*, through August 4, 2024.

Support & Acknowledgements

Acknowledgements

Before Yesterday We Could Fly: An Afrofuturist Period Room is made possible by the Hobson/Lucas Family Foundation and the Director's Fund. Additional support is provided by Art Mentor Foundation Lucerne and the Terra Foundation for American Art.

Don't Forget to Call Your Mother is made possible by Joyce Frank Menschel. ♦ The exhibition consists of works in The Met collection from the 1970s to today that inspire reflection on the power of found objects and the complicated feelings of nostalgia and sentimentality they can conjure.

Afterlives: Contemporary Art in the Byzantine Crypt is made possible by The Jaharis Family Foundation. ♦ The exhibition brings together modern-day works that reckon with death and visualize the afterlife and Byzantine Egyptian funerary art and artifacts in part of the Mary and Michael Jaharis Galleries known as the Byzantine Crypt (Gallery 302).

The Harlem Renaissance and Transatlantic Modernism is made possible by the Ford Foundation, the Barrie A. and Deedee Wigmore Foundation, and Denise Littlefield Sobel. Corporate sponsorship is provided by Bank of America. Additional support is provided by the Enterprise Holdings Endowment, the Terra Foundation for American Art, the Gail and Parker Gilbert Fund, the Aaron I. Fleischman and Lin Lougheed Fund, and The International Council of The Metropolitan Museum of Art.

The Real Thing: Unpackaging Product Photography is made possible by The Robert Mapplethorpe Foundation, Inc. ♦ The exhibition illustrates how commercial camerawork contributed to the visual language of modernism, suggesting new links between the promotional strategies of vernacular studios and the interwar avant-garde.

The Ink and Ivory: Drawings and Photographs Selected with James Ivory is made possible by The Hagop Kevorkian Fund. Additional support is provided by the Lavori Sterling Foundation Endowment Fund. ♦ The exhibition presents a selection of superlative drawings from the courts and centers of India and Pakistan (with a few related Persian works) dating from the late sixteenth to the twentieth century.

Support

With steadfast commitment and support from our friends, The Met's Department of Photograph Conservation continues to thrive as a crucial resource for the preservation of works of art, as well as a vibrant center for research.

To learn more about how you can become involved and support this critical area at The Met, please contact:

Hannah F. Howe
Deputy Chief Development Officer of Individual Giving
212-731-1281
hannah.howe@metmuseum.org

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Department Contact
Aleya Lehmann
212-570-3810
aleyalehmann@metmuseum.org

Contributors to Bulletin No. 33:
Jonathan Farbowitz, Nora Kennedy, Natasha Kung, Aleya Lehmann, Felice Graciela Robles, Katie Sanderson, and Cat Stephens

Bulletin Archive

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Above:
Schadde Brothers (American, active Minneapolis, 1890s–1910s), High Grade Jelly Eggs, ca. 1915. Gelatin silver print with applied color, 8 1/4 × 9 3/4 in. Twentieth-Century Photography Fund, 2013. (2013.923)

On view in *The Real Thing: Unpackaging Product Photography*, through August 4, 2024