

The Remaking of a Modernist Icon: Marcel Duchamp's *Nude Descending a Staircase (No. 3)*

ABSTRACT

Nude Descending a Staircase (No. 3) is a full scale re-creation by Marcel Duchamp of his seminal 1912 oil painting, *Nude Descending a Staircase (No. 2)*. The collector Walter Arensberg commissioned the work in 1916 after he failed to acquire the original at the New York Armory Show in 1913. The work is executed in a variety of media including ink, graphite, water-based paint, and colored pencil/crayon over a full-scale photographic enlargement of the original painting. Duchamp's dynamic reworking of the image almost completely obscures evidence of the underlying photograph, complicating characterization of the object. Existing as both drawing-painting and photograph, *Nude Descending (No. 3)* is at once a "reproduction" as well as a singular, powerful work of art in its own right. This paper examines the diverse materials and techniques of its creation as revealed through close examination and scientific analysis, including scanning electron microscopy-energy dispersive spectroscopy (SEM-EDS), gas chromatography-mass spectrometry (GCMS) and Fourier transform infrared microspectroscopy (MFTIR), and historical research. The composite nature and inherent fragility of the object presents formidable challenges for its conservation. Condition problems and conservation requirements resulting from the work's complex structure and rich history, as well as the context in which it was created and exhibited—including a brief appearance in a department store window display—are presented.

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INTRODUCTION

While Marcel Duchamp's iconic *Nude Descending a Staircase* undoubtedly is familiar to anyone who has opened an art history textbook—and likely to many who haven't—few are aware that multiple unique versions of the seminal work were executed by the artist. These include a 1911 oil study, the iconic 1912 oil painting (fig. 1), and a full-scale replica executed by the artist in 1916 using a variety of media over a large photograph of the original painting. This paper provides a brief history behind the creation of the unique 1916 version (fig. 2), now known as *Nude Descending a Staircase (No. 3)* and highlights its materials, techniques, and issues for conservation. All three *Nude Descending* versions, in addition to other related works by Duchamp, are part of the Louis and Walter Arensberg Collection, which forms a cornerstone of the Philadelphia Museum of Art's modernist holdings.

HISTORICAL BACKGROUND

In November of 1912, the American painter Walter Pach and two associates were engaged in a whirlwind tour across Europe in a search for the newest and boldest artworks the continent had to offer. The occasion was their ambitious upcoming International Exhibition of Modern Art, to become known simply as the Armory Show. At the time, Paris was the established center of the avant-garde, and one stop was the suburban studio of three artistic brothers: Raymond Duchamp-Villon, Gaston Duchamp (also known as Jacques Villon), and Marcel Duchamp. From the twenty-five-year-old Marcel, four works were selected. During the studio visit co-organizer Arthur Davies remarked of the relatively little known painter's work, "That's the strongest expression I've seen yet" (Brown 1988). By the time of the Armory Show's closing, Duchamp would enjoy near celebrity status in America and his odd, angular painting of a figure descending a stair-



Fig. 1. *Nude Descending a Staircase (No. 2)*. Oil on canvas. Louise and Walter Arensberg Collection, Philadelphia Museum of Art. 1950.134.59.



Fig. 2. *Nude Descending a Staircase (No. 3)*. Graphite, pen and black ink, colored pencil/crayon, and blue wash over a mounted gelatin silver photograph. Louise and Walter Arensberg Collection, Philadelphia Museum of Art. 1950.134.60.

case would be forever marked as one of the most significant and controversial signposts of modern art.

The painting was purchased from the Armory Show by San Francisco collector and art dealer Frederick Torrey, who in a moment of inspiration wired New York while returning by train to California. Torrey's telegram to organizer Walter Pach reads: "I WILL BUY DUCHAMP NUDE WOMAN DESCENDING STAIRWAY PLEASE RESERVE" (Naumann 1991).

Following the success and scandal of the Armory Show, and with war raging in Europe, Pach convinced Duchamp to move to New York. Arriving on June 15, 1915, the artist was introduced immediately to Walter and Louise Arensberg and would stay in their Manhattan apartment while they summered in the country (Tomkins 1996). The Arensbergs had developed a deep interest in the avant-

garde following the Armory Show, and throughout their lives would prove to be the artist's greatest supporters and patrons.

THE REMAKING OF AN ICON

In 1916, Duchamp moved into a new studio in the Arensbergs' building at 33 W. 67th St. and resumed work on his enigmatic *Large Glass*, also known as *The Bride Stripped Bare by Her Bachelors, Even*. It is in this studio, in October 1916, that Duchamp would execute at the commission of Walter Arensberg, a full-scale replica of the 1912 *Nude Descending a Staircase* oil painting that had eluded the collector three years earlier (Schwarz 1997). An account of the making of the *Nude Descending* replica was captured by

the writer William Carlos Williams in his prologue to *Kora in Hell*:

We returned to Arensberg's sumptuous studio where he gave further point to his remarks by showing me what appeared to be the original of Duchamp's famous "Nude Descending a Staircase." But this, he went on to say, is a full-sized photographic print of the first picture with many new touches by Duchamp himself and so by the technique of its manufacture as by other means it is a novelty! (Williams 1918, 8–9)

Indeed a novelty in Duchamp's body of work, the commissioned piece also invites examination of the artist's foray into the nature of a work of art as a singular entity, a concept he was beginning to challenge in 1916 with replicas of his readymades, and which he would obliterate later in his career with the *Box in a Valise*, his portable museum of miniature replicas.

Ironically, just three years later the two *Nude Descending* versions would unite when Arensberg purchased the original oil painting from Mr. Torrey. Both works appear in photographs of the Arensbergs' apartment in 1919 taken by the prominent American artist Charles Sheeler. In 1918, Duchamp would make one more unique version of the painting—albeit a miniature one—for New York socialite Carrie Stettheimer's eclectic dollhouse, now in the collection of the Museum of the City of New York. The tiny ink and watercolor version, now referred to as *Nude Descending a Staircase (No. 4)*, is only a few centimeters wide and appears alongside other diminutive works contributed by artists from her circle of friends (Schwarz 1997; Tomkins 1996).

The Arensbergs left New York for southern California in 1927, and for over two decades their Hollywood home practically burst at the seams from their growing collection of modern art. In 1950 the Philadelphia Museum of Art was chosen to become the permanent repository of their unparalleled collection. Interestingly, during the course of research correspondence was discovered (Duchamp 1942; Arensberg 1943) in which Duchamp had planned to make for Arensberg yet another full-scale replica of an early oil painting, *Sad Young Man on a Train*, the only one of his Armory Show pictures still eluding the collector in 1942. However, neither this nor any other "life size" replica of a painting was ever realized (Sawelson-Gorse 1991).

NUDE DESCENDING (NO. 3) STRUCTURE: THE PHOTOGRAPHIC SUPPORT

The primary support for *Nude Descending a Staircase (No. 3)* is a photographic enlargement measuring approximately 58 x 39 inches. The photograph is wrapped around an

auxiliary support consisting of a wood panel faced with brown cardboard (fig. 3). The panel consists of numerous individual wood strips, edge-joined and prepared with gesso, and the photograph mounted securely overall. The top and bottom ends of the primary support are trimmed flush with the rough-hewn edges of the panel, suggesting that the construction was cut down after the photograph was mounted.

While much of the photographic image is obscured by the relatively heavily applied drawing materials, the surface remains exposed along the side edges where the photograph is wrapped around to the back of its support panel. Visual and microscopic examination reveal a photographic emulsion (binder) with a relatively matte, rough surface texture; the texture is imparted by the paper fibers of the primary support. Close examination of detached emulsion fragments reveals a thin baryta layer (barium sulfate, BaSO₄), its presence confirmed through instrumental analysis and polarized light microscopy. The photographic image exhibits a uniform warm brown tonal quality that suggests sulfur or "sepia" toning, a process popular at the time in which metallic silver is replaced with silver sulfide, stabilizing the print against image deterioration (Eastman Kodak 1931). The sepia toning process was an aesthetic choice as well, evoking the appearance of earlier popular photographs such as the albumen print. Toning may have been exploited deliberately in this case to capture the tonality of the original oil painting and its relatively earthy palette.

PHOTOGRAPHIC SUPPORT: EXAMINATION OF CROSS-SECTIONS

In order to further characterize the photographic support for *Nude Descending (No. 3)* microscopic fragments

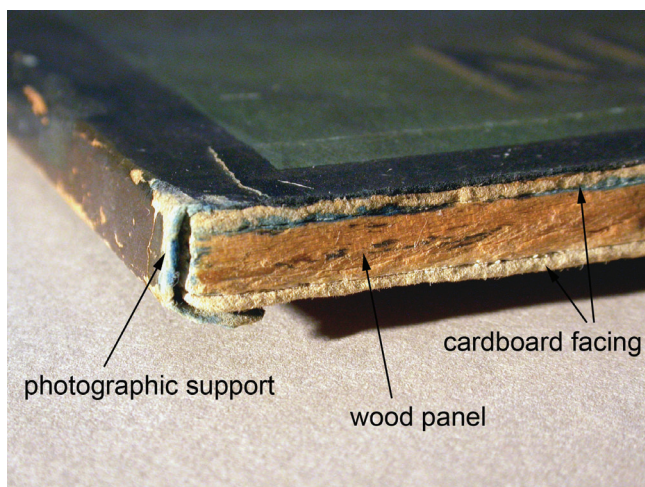


Fig. 3. Corner view of *Nude Descending (No. 3)*, showing the reworked photographic enlargement wrapped around and mounted to a wood panel faced with cardboard.

from the edges of the picture were prepared as cross-sections and examined using visible and fluorescence light microscopy. Visual examination of the photographic structure in cross-section reveals silver image-forming particles dispersed throughout the binder layer, particularly evident in samples obtained from high-density regions of the photographic image. Selected sections were examined further using scanning electron microscopy (SEM) with energy dispersive and wavelength dispersive x-ray spectroscopy (EDS and WDS). EDS element mapping confirmed the image material as consisting of elemental silver or a silver salt (silver sulfide), likely a combination of the two for a print that has been sepia-toned. Fourier transform infrared microspectroscopy (MFTIR) and gas chromatography-mass spectrometry (GCMS) confirmed the binder as gelatin. Element mapping also confirmed a barium sulfate substrate (baryta layer), as well as traces of residual chlorine and bromine, all consistent with a silver gelatin developing-out paper. The thin baryta layer can be seen in cross-section (fig. 4a) as an irregular white particulate material settled mostly in the interstices of the paper fibers. In addition to the image material, the gelatin binder layer was revealed to contain large starch granules, visible prominently in cross-section using fluorescence light microscopy with a combination of ultraviolet and visible illumination (fig. 4b). Starch was used extensively in the industry as a matting agent in photographic papers, incorporated into the gelatin emulsion layer during manufacture (Price and Sutherland 2005). Polarized light microscopy confirmed the granules to be rice starch based on grain size and morphology (Stoeffler 2000).

PHOTOGRAPHIC SUPPORT: MANUFACTURE AND MOUNTING

While almost no documentation exists about the creation of *Nude Descending (No. 3)*, a label on the reverse of the mount preserves the identity of the studio that produced and mounted the print. The label reads: “Ye Little Photo Shoppe / Developing, Printing and Enlarging / Hotel Chelsea bldg. / 228 West 23rd Street” (the Hotel Chelsea is itself a New York landmark with its own rich history). The attached label suggests that the mounting was carried out by the commercial photography studio prior to delivery to Duchamp. In fact, photography studios routinely offered a variety of mounting options for enlargements including stretchers for displaying them in the fashion of oil paintings. While mounting techniques available at the time included aqueous adhesive systems, as well as the newly developed “dry-mount” technique (Jarman 1916), the *Nude Descending (No. 3)* print appears to be adhered overall with a starch-based adhesive. Tack marks located along the wrapped edges of the support preserve visual evidence of the typical enlarging process for bromide printing at the

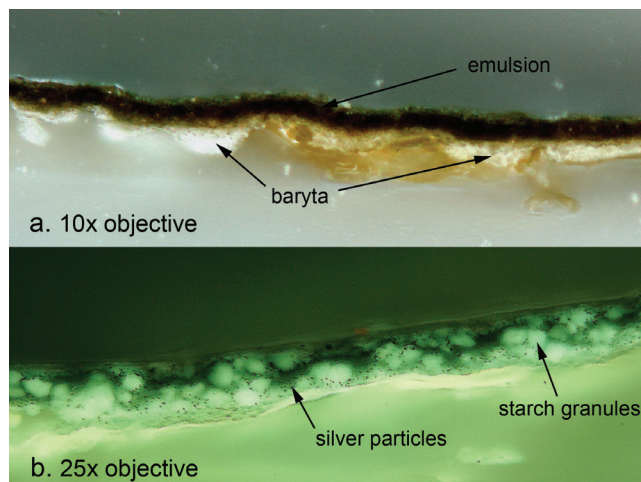


Fig. 4. Cross-sections of the photographic support: (a) the emulsion and barium sulfate (baryta) substrate (in visible illumination); and, (b) starch granules incorporated into the gelatin emulsion and silver image particles (in combined visible/ultraviolet illumination).

time: exposure using a horizontal enlarging camera with the sensitized photographic paper tacked upright to a board and exposed using an artificial light source (Fraprie 1916; Osborne 1911).

A 1916 Kodak sample book from the George Eastman House International Museum of Photography and Film in Rochester, New York, offered a valuable comparative source for the type of photographic paper that may have been used for the enlargement (Eastman Kodak 1916). A close visual match was found in the Eastman House collections: a double weight bromide developing-out paper, exhibiting similar surface texture, binder, and paper thicknesses. An Eastman Kodak Company catalogue from the same year details this bromide enlargement paper, offered as: “a heavy rough paper for crayon and air brush work” (Eastman Kodak 1917, 169). The paper also was offered in ten-yard-long rolls of forty inches in width. The actual width of the photographic support for *Nude Descending (No. 3)* is trimmed just under forty inches, consistent with such a roll paper or a similar one produced at the time by Kodak or another manufacturer (Fraprie 1916).

DRAWING MATERIALS AND TECHNIQUES

While the source negative used to produce the photographic enlargement has not been identified (McManus 2006), it was almost certainly small, and the enlargement consequently suffers from an extreme loss of resolution. This poor resolution is most noticeable on the exposed edges where the photographic image remains unobscured by applied media. Duchamp’s extensive reworking of the design was therefore essential, and echoes the once popular tradition of crayon portraiture—enhancing and

providing greater definition and richness to a relatively limited photographic image beneath (Whiting 1914; Eder 1978).

The beautiful result is a slightly mechanized re-imagining of the earlier painting: crisp, hard-edged, and dynamic. The somewhat earthy palette of the oil painting has given way to parallel ruled lines, the silvery metallic sheen of graphite and splashes of cool blue. Careful examination reveals additional clues about Duchamp's materials and working process. The artist appears to have used graphite to trace out and further define elements of the relatively diffuse photographic image. Broad areas of graphite shading were achieved using smudged or wiped graphite (possibly in conjunction with a wet technique) with areas of erasure. Additional design work consists of black pen and ink lines (fig. 5), some applied with the guide of a straight edge and a curved template. The ink lines often form long parallel bands filled in with densely applied graphite, imbuing the work with added definition and a strong sense of linearity.

The only broadly applied liquid medium apparent on *Nude Descending (No. 3)* is a blue wash, the most notable characteristic of which is its extreme mobility. With visual characteristics of a very fluid ink or paint, the blue exhibits a loose, brushy application including areas where subsequent liquid drips caused the blue colorant to move and redeposit forming tidelines (fig. 6). Examination of areas of loss in the photographic surface reveal how surprisingly mobile the blue wash was; it readily penetrated through the photographic emulsion and baryta layer, staining the paper fibers below. Analysis using MFTIR suggests the colorant is Prussian blue, based on the prominent nitrile peak characteristic of a cyano-complex visible in the infrared spectrum, in combination with a relative abundance of iron detected in a sample using EDS.

In addition to the graphite, black ink, and blue wash, Duchamp worked up his composition using a set of colored drawing materials, dramatically applied in patterns of dynamic swirls (fig. 7). The colored drawing materials display visual characteristics of a wax-based colored pencil or crayon (Borgeson 1995). Distinguishing between these wax-based media can be extremely difficult, even utilizing analytical techniques, as both contain roughly the same basic ingredients and the relative concentrations are hard to quantify (Reid et al. 2002). Characterization is further complicated by the interchangeable use of such terms as "crayon" and "colored pencil" in period trade literature (Ellis and Yea 1988). However, based on the handling of the material and such characteristics as texture and line width and uniformity, the material most resembles colored pencil. These characteristics can be observed clearly where Duchamp's strokes extend over onto the side edges and trail off. The strokes also provide additional evidence that

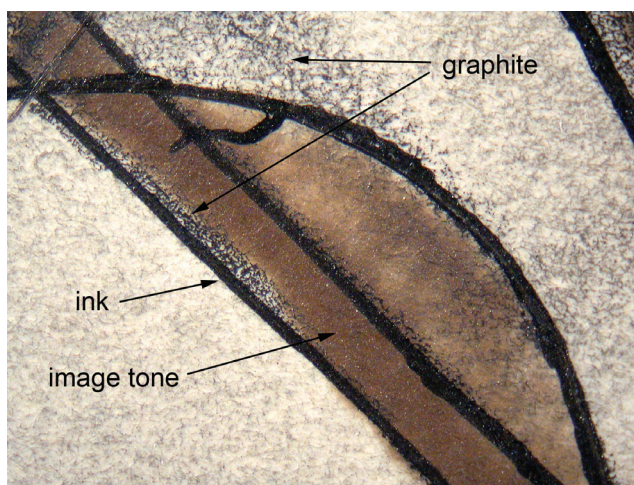


Fig. 5. Surface detail revealing the warm brown image tone of the photograph and applied graphite and ink lines (c. 6x magnification).

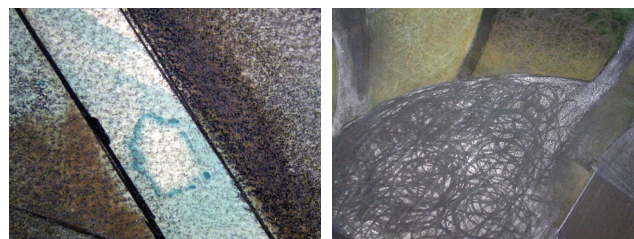


Fig. 6. Surface detail showing graphite, black ink lines, and blue wash with liquid-induced tideline formation (c. 6x magnification).



Fig. 7. Surface of *Nude Descending (No. 3)* in specular illumination, showing swirls of colored pencil/crayon applied over an area of heavy graphite.

the photographic support was mounted to the panel prior to execution of the design.

Analysis of the colored drawing materials using MFTIR detected kaolinite, a standard filler in colored pencils, in addition to evidence of organic binder components. Spectral bands were observed indicative of a fatty acid salt, possibly an additive to the drawing medium or derived from a reaction of pigment with the binder phase. GCMS provided additional information on the organic binder, identifying components consistent with paraffin and Japan wax (figs. 8a–b). Figure 8b shows a mass spectrum corresponding to the dimethyl ester of docosanedioic acid, one of several minor components characteristic for Japan wax, detected in a sample from the drawing material. Japan wax has been documented in the literature as an important ingredient in pencil manufacture (Warth 1956).

At least four distinct colors were used by Duchamp in the work: light blue, light tan, a darker orange-brown, and a dark grey or black. Analysis of samples using EDS revealed elemental compositions suggestive of a number of inorganic pigments. One representative spectrum, for example, shows the presence of chromium and lead con-

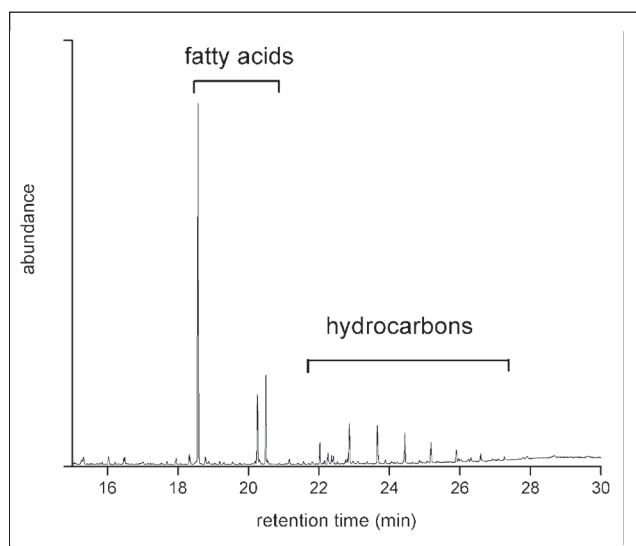


Fig. 8a. Total ion chromatogram from GCMS analysis of a sample of tan colored drawing material, showing the presence of hydrocarbons and fatty acids (detected as their methyl esters) indicative of paraffin and Japan wax, respectively.

sistent with a colorant, such as chrome yellow (PbCrO_4) (Feller 1986), in addition to elements corresponding to iron oxide pigments and kaolinite ($\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4$) (fig. 9).

A page from a Frost & Adams artist's materials catalogue from the period featuring colored pencils (Ellis and Yea 1988; www.leadholder.com 2006) lists colors that are in striking accordance with the *Nude Descending* palette, including sky blue, light brown, and dark brown. Duchamp may have used a similar set of drawing materials for his work. As with the photographic papers explored earlier, evidence and an awareness of specific materials that were available to the artist at the time are invaluable in unraveling the making of the *Nude Descending* replica. Unfortunately, during the period around 1916, Duchamp was so enveloped in the complex programme of his *Large Glass* that he produced very little graphic work (Bonk 1989), and the use of similar wax-based colored drawing materials elsewhere by the artist (during the period) has not yet been discovered by the authors.

CONDITION PROBLEMS AND STABILIZATION

Due to the composite nature of *Nude Descending a Staircase (No. 3)* and its complex structure, the work exhibits fairly extensive condition problems involving the photographic support, presenting challenges for the conservator. These include mechanical damage from handling and use, as well as aging of the materials from exposure to varying environmental conditions. Furthermore, some specific condition problems appear to be directly related to the artist's working process. One particularly dramatic issue relates to the ink and graphite application process: the pres-

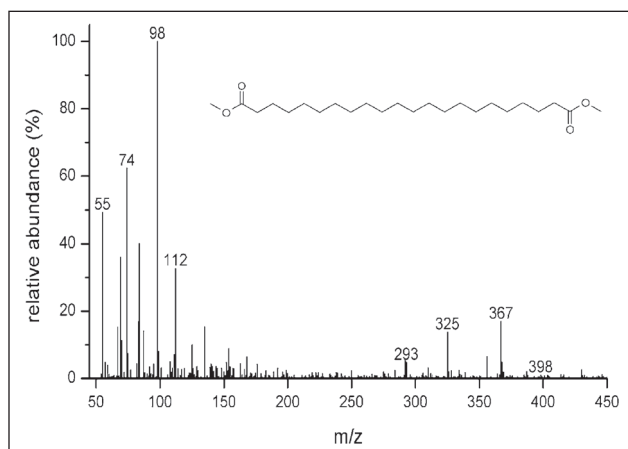


Fig. 8b. Mass spectrum corresponding to the dimethyl ester of docosanedioic acid, a characteristic component of Japan wax.

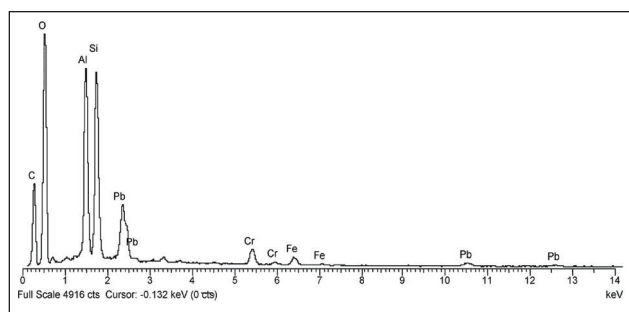


Fig. 9. EDS spectrum from a sample of orange-brown colored drawing material, showing elements consistent with chrome yellow, an iron oxide pigment, and kaolinite.

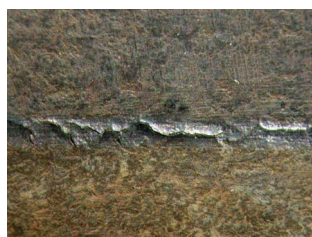


Fig. 10. Graphite line with stress-induced cracking of the photographic emulsion (c. 8x magnification).



Fig. 11. Highlight area with extensive flaking of the photographic emulsion (c. 6x magnification).

sure exerted by the tip of Duchamp's ink pen stressed and even cut into the surface of the photographic emulsion in areas, resulting in the formation of dramatic, long splits. These splits occur along ink lines throughout the composition, and are accompanied by numerous small losses in the vulnerable, lifting emulsion. Similar damage occurs where the graphite pencil stressed the emulsion and led to eventual cracking (fig. 10).

One final, prominent condition problem involves Duchamp's apparent use of washed or smudged graphite as

a design component; highlights appear in the composition where selective removal or absence of the broad grey areas of graphite exposes the white of the photograph beneath. Several of these highlight areas exhibit pronounced flaking, often with directional cracks that at times appear to trace brush strokes (fig. 11). Examination of the flakes using MFTIR and in cross-section using light microscopy and SEM-EDS did not detect additional materials on the surface in these areas that might account for the localized flaking. One possible cause could be the use of a liquid or solvent by the artist to create the highlights by selectively manipulating or removing the smudged graphite. Such a process might have contributed to stress in the emulsion layer and led to its eventual cracking. Whatever the cause, this curious and rather serious condition problem warrants further investigation.

Following thorough examination to identify and document the object's condition, treatment was carried out first to consolidate and repair the photographic support along the side edges, where it had been more vulnerable to damage (particularly from handling and framing). Mechanical damage sustained along the edges included tears, punctures, and delamination of the paper support, in addition to binder insecurity and loss. Stabilization and reinforcement of the mechanical damage was carried out using cooked, precipitated wheat-starch paste, methyl cellulose, and thin Japanese paper. Stabilization of the surface primarily involved consolidation of extensive areas of insecure, lifting emulsion using a solution of photographic-grade gelatin applied with a fine brush, carried out while viewing through the stereomicroscope. Consolidation efforts focused on the most pronounced lifting associated with the long splits. Slight pressure was applied when necessary through silicone release Mylar to readhere vulnerable raised edges or flaps of the photographic emulsion.

The severe flaking encountered throughout the white highlight areas as described above was not treated at this time, as techniques explored for consolidation were judged unsatisfactory; the areas remain a source of instability for the object and a factor impacting its display. With the current stabilization phase complete, the original frame will be retrofitted to provide adequate housing, and the work reinstalled in its frame with new protective glazing.

ADDITIONAL CONTEXT AND HISTORY

Although Walter Arensberg had been too late to acquire any of Duchamp's paintings directly from the Armory Show, he eventually would amass the largest collection of the artist's work anywhere in the world. Today, the Louise and Walter Arensberg collection at the Philadelphia Museum of Art includes both large *Nude Descending* versions in addition to the smaller oil study. While both large versions have been exhibited together on a few occasions,

for example in the landmark 1963 Duchamp retrospective at the Pasadena Art Museum in Pasadena, California (Clearwater 1991), more often *Nude Descending (No. 3)* has been exhibited as a surrogate for the oil painting. This has included either lending it to a borrowing institution when loan of the oil painting was not possible, or having it remain on view at the Philadelphia Museum of Art while *Nude Descending (No. 2)* was exhibited elsewhere.

Curiously, in January 1960 the *Nude Descending* replica traveled to Newark, New Jersey, where it was installed as part of a window display at Bamberger's department store (Wohl 2003). The display, which included several unclothed mannequins descending a makeshift staircase, was arranged by Duchamp himself to promote the publication of a new catalogue raisonné by Robert Lebel. The Bamberger's window display was not the first by Duchamp: in 1945 the artist arranged displays at Brentano's Bookstore and at Gotham Book Mart in New York for the promotion of surrealist publications by André Breton. In fact, Duchamp's connection to the shop window display traces back to his early life and to his fascination with objects like the chocolate grinder, once admired through a shop window in Rouen. And of course associations to the *Large Glass* itself, as noted by several Duchamp scholars, are unavoidable.

Ironically, even fifty years after the scandal and success of the Armory Show, the American public still was unaccepting of depictions of the female nude—even in plastic—and the window display was dismantled after only a few days due to public outcry.

CONCLUSION

Today, due to a greater understanding of its material instability, particularly the extent of the flaking photographic emulsion and other inherent vulnerability, *Nude Descending a Staircase (No. 3)* is no longer able to travel. Additional research into this wonderful and unique work, such as the search for the negative used to produce the enlargement, will continue to yield surprises and valuable insights. Finally, *Nude Descending a Staircase (No. 3)* provides a fascinating window into the role of the replica in Duchamp's body of work, and on the artist's profound influence on the generations of artists since.

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