Käsebier's Photographic Printing Methods and Their Long-Term Preservation

By Debra Hess Norris, Jennifer Jae Gutierrez, and Greta Glaser

Throughout different stages of her prolific career Gertrude Käsebier utilized a remarkable range of photographic printing processes from albumen and silver gelatin to platinum and gum bichromate. Where possible, these processes were further combined and manipulated to achieve stunning artistic effects, for example, she printed images on lightweight Japanese papers, rendered similar processes in multiple colors, and extensively retouched her prints with traditional drawing media such as watercolor and charcoal.

Käsebier's oeuvre, well represented in the collection of the University Museums at the University of Delaware, is a lexicon of photographic print technology available from 1890 to 1930 and a superb resource for the study of photographic print materials, their stability and preservation. Her often-pioneering photographic work captured Pictorialism long after the movement had collapsed.

While much has been written about Gertrude Käsebier's personality and life, little is known about her darkroom techniques. This catalogue essay, summarizing Käsebier's photographic printing processes, their manufacture, identification, scientific analysis, and conservation, is based on the visual and scientific examination of selected pictorial works.[i]

Introduction

The Käsebier holdings in the University Museums' collection consist of 158 photographic prints. While this collection does not contain her original negatives, we know that Käsebier used only gelatin dry plates primarily ranging in size from 6 ½ x 8 ½ inches (whole plate) to 8 x 10 inches. [ii] Käsebier carefully planned her compositions at the time of image capture often using soft-focus lenses. Subsequent chemical and manual manipulation of the negative prior to contact printing allowed for a more painterly effect.

Most common in the University Museums' collection of Käsebier photographs are non-silver platinum and gum bichromate prints. By manipulating a plethora of printing processes, Käsebier produced evocative prints from the same negative with divergent tonalities and temperaments.

Within the University Museums' collection there are multiple examples of interesting image pairs, most notable a portrait series of John Sloan taken in 1907 when she photographed several members of The Eight, or Ash Can School. Barbara Michaels' in-depth study of Käsebier's life and work revealed that Sloan admired Käsebier's work and recorded in a 1907 diary entry, "She sure knows her profession, sure gets you at your ease." Michaels also notes that Sloan kept his portrait by Käsebier, as well as those of his colleagues, throughout his life.[iii]

Fig. 1(top) Detail *Portrait of John Sloan*, 1978.2.664. Platinum print on thin tissue (3 microns) paper with a smooth surface.

Fig. 2 (middle) Detail *Portrait of John Sloan*, 1978.2.663. Platinum print on heavy-weight (10 microns) wove paper with a coarse texture like watercolor paper.

Fig. 3 (bottom) Detail *Portrait of John Sloan*, 1978.2.661. Gum bichromate print on medium-weight (8 microns) wove paper with slight texture.

In some cases, Käsebier printed one negative using the same photographic process multiple times, and in others she chose to print the same negative using different photographic processes. The series of image details at left, representing three portraits of John Sloan printed from the same negative, clearly illustrates the variation of printing techniques and materials she might apply to one image. Close examination and comparison of these prints highlight Käsebier's experimentation with a wide variety of paper supports and image-manipulation techniques to achieve a range of print characteristics. These works and processes (described below) differ significantly from the mechanically precise images provided by more traditional black-and-white silver gelatin papers popular during Käsebier's era.

While Käsebier often coated her own papers, she also occasionally purchased commercially-prepared photographic papers. Evidence of hand-coating may often be found in the margins of un-cropped prints where brush strokes are readily visible in visible or raking light. Hand coating offered Käsebier the ability to modify significantly sensitizing solutions and paper type. Her experimentation led to the use of unique methods, such as printing a silver image on tissue (*Agnes,* 81.10.4) - an uncommon find in any era of photography. Here, the thin tissue paper diffuses light and creates a softer image in comparison to traditional sharply focused, black-and-white silver gelatin print materials. Käsebier's artistic ingenuity fostered experimentation with combinations of printing processes and paper quality until the very best print and desired effect was achieved.

Platinum Printing

Käsebier favored the platinum or platinotype process invented by William Willis and Alfred Clements in 1873 and widely popularized by the 1890s.[iv] These papers, impregnated with light-

sensitive ferric salts, yield a soft and luminous tonal range with stunning middle value separation.

The platinum technique involves coating a paper with light-sensitive iron and platinum salts. The paper is then exposed to a strong light in direct contact with a negative. The iron salts react to light and are reduced from the ferric state to the ferrous state; usually a faint image can be seen on the paper at this point. After exposure, the paper is placed in a potassium oxalate developing bath that converts platinum salts into metallic platinum. [v] The platinum process was celebrated by artistic photographers and employed particularly by the Pictorialist movement whose adherents, including Alfred Stieglitz, Clarence White, and F. Holland Day, advocated for photography as fine art. [vi]

Although platinum papers were readily available commercially, the ease of preparing papers allowed for enhanced sensitivity, multiple printing, and hand application of image-forming chemicals to produce prints of various colors and textures. Visual analysis of the University Museums' collection, reveals that Käsebier used a wide variety of high-quality cream-colored papers ranging from 3 -11 microns in thickness with rough, smooth and highly calendared fine finishes. Käsebier often favored a light-weight, long-fibered Japanese paper counter-mounted to a secondary support in order to achieve atmospheric effects sympathetic to her suggestive imagery.

A beautiful pair of platinum prints entitled *Solitaire* in the University of Delaware Museums' Collection illustrate the range of image tones or color that characterizes many of Käsebier's platinum prints. Some prints consist of cool gray image tones (Figure 4) whereas others are browner in tonality (Figure 5). Käsebier controlled the image tone of

Fig. 4 Detail, *Solitaire,* 1979.2.11. Platinum print on heavy-weight (unable to measure the thickness of the primary support because it is mounted overall to a secondary support) wove paper with a slight texture.

Fig. 5 Detail, *Solitaire,* 1983.6.2. Platinum print on heavy-weight (11.5 microns) wove paper with a rough surface texture.

her prints in a variety of ways; (a) by manipulating the temperature of the developer resulting in a warm or cold bath solution, (b) toning with silver or uranium, or (c) adding mercuric chloride to the developer.

The use of visual or microscopic examination is not sufficient to identify specific development or toning techniques used to create a print. As a result, conservators and conservation scientists use X-ray fluorescence spectrometry (XRF), to make this distinction by analyzing the elemental composition of photographic images. This technique allows for qualitative and quantitative analysis of images without invasive sampling of the photograph itself. [vii] [viii] XRF analysis can be used to confirm the presence of a photograph's final image material (silver or platinum, for example) and/or to detect elements used during toning. Combined with careful visual analysis, this non-destructive analytical technique can be utilized with other types of instrumental analysis, to help to unravel Käsebier's darkroom techniques.

The information gained during XRF examination is collected by a computer equipped with software to help conservators and conservation scientists interpret what elements are detected. This information is presented in the form of a spectrum as seen in Figure 6. In 2011, photograph conservator, Tram Vo, and conservation scientist, Dusan Stulik, of the Getty Conservation Institute, Los Angeles, CA published their landmark investigation of 56 Käsebier prints from the J. Paul Getty Museum using XRF. Among a range of findings, XRF analysis identified the presence of mercury in 34 of the prints studied. As anticipated, varying amounts of iron, attributed to residual chemistry, were also found in nearly all of the prints. Both warm brown and cool gray prints alike exhibited the presence of mercury and/or lead used in the developer. [ix] XRF data gathered from the two prints of *Solitaire* (see example from one print *Solitaire***,** 1983.6.2 below) at the University's Collection is congruous with the results found in the Getty's Collection and suggest that both prints (gray and brown in tonality) are mercury-developed platinum prints.

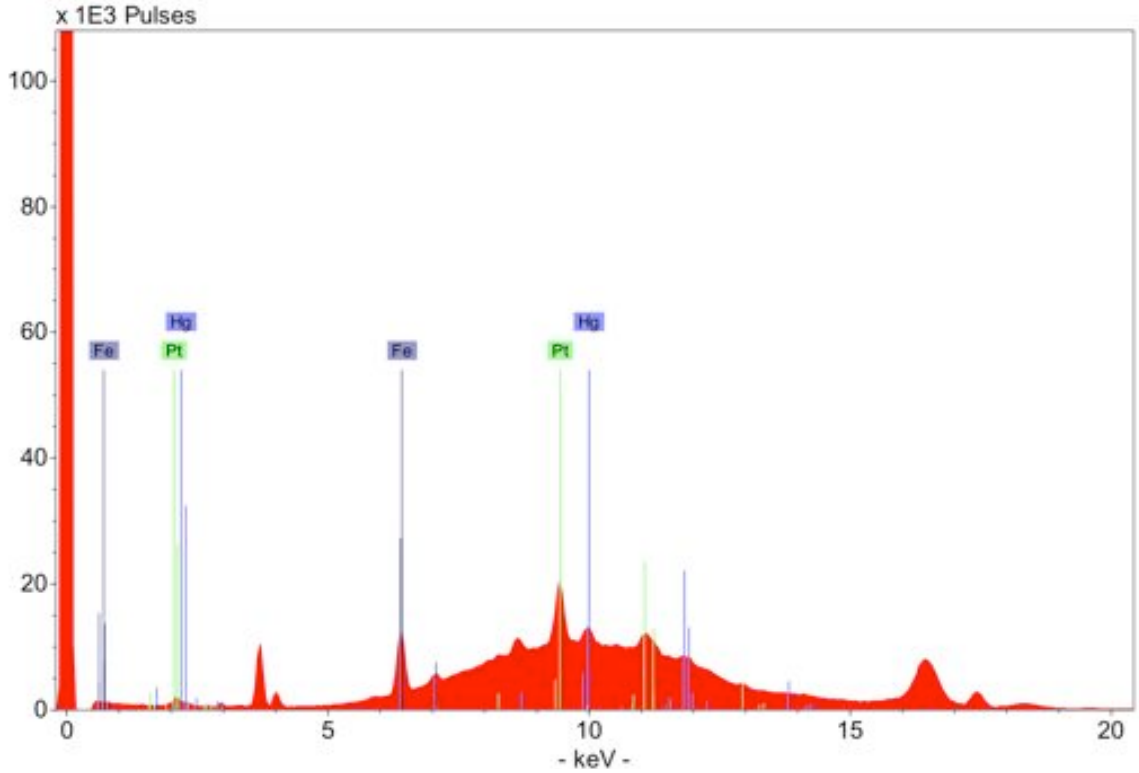

Fig. 6 *Solitaire*, 1983.6.2; XRF spectrum from a high image-density area. Peaks for platinum (Pt) and mercury (Hg) suggest that this photograph is a mercury-toned platinum print. Iron (Fe) represents residual light-sensitive chemistry left in the print after processing.

Fig. 7 Detail, *Woman Feeding Ducks,* 1985.2.16. Platinum print.

Platinum images are comprised of finely-divided platinum metal embedded in a paper support. Examination of platinum prints under microscopic analysis (see Fig. 7) reveals a labyrinth of paper fibers, a continuous tone image created by the platinum image material, and the absence of a binding media such as egg white or gelatin. In fact, it is this one-layer structure that results in the rich, velvet-like surface character that can distinguish these materials from their contemporary smooth-surfaced and highly reflective silver-gelatin papers that consist of two to three layers of material coated on a paper support.

Metallic platinum in its blackened, powdered form remains unaffected by air, moisture, and acids. It is an extremely non-reactive and permanent material. Therefore, platinum prints are generally in good to excellent condition - not prone to fading or discoloration

symptomatic of the silver-based processes such as albumen or silver gelatin. Despite their stability, platinum papers may yellow or become embrittled due to the presence of residual iron salts and caustic residues from the highly acidic processing solutions required to clear unexposed ferric salts. Glycerin developed prints may appear especially discolored - although this degradation mechanism is not well understood. The catalytic activity of the metallic platinum can accelerate paper degradation resulting in discoloration and embrittlement.

Gum Bichromate Printing

The gum bichromate process was introduced to photography in 1858 [x] and popularized in the 1890s. It was another technique favored by the Pictorialist photographers and was well suited to Käsebier's expressive demand. This process is more laborious than other "direct" printing processes, and therefore fewer gum prints were made in the nineteenth and early twentieth centuries.

In this process, sized papers of all kinds were brush coated with a solution of pigmented gum arabic and light-sensitive bichromate salts. While many pigments were suitable, chemically inert lamp black, burnt and raw umber, and burnt sienna were favored by Käsebier and her colleagues for their opacity and compatibility with nineteenth century photographic image tonalities. Like the platinum process these papers were printed in contact with a negative. Following exposure, gum bichromate prints were gently washed face down in a warm water bath yielding a pigmented image similar in cross-section to watercolor. Like her platinum printing, Käsebier regularly modified her gum prints by varying the thickness and layering of the coating, the proportion of gum to pigment, relative roughness of the paper, and by using localized brush development to yield a more painterly effect.

The following two details, taken from prints untitled by Käsebier and referred to in the University Museums' collection as *Woman Feeding Ducks,* nicely illustrate Käsebier's use of the same glass plate negative to produce distinctly different images in the platinum and gum bichromate processes.

Fig.8 Detail, *Woman Feeding Ducks,* 1985.2.16. Platinum print on heavy-weight (10 microns) wove paper with a smooth surface texture.

Fig.9 Detail, *Woman Feeding Ducks,* 1979.2.2. Gum bichromate print on medium-weight (7 microns) laid paper with a rough surface texture.

In the platinum detail (Fig.8) one can see the rich, highly detailed, continuous image tone characteristic of Käsebier's platinum prints. In the gum bichromate detail (Fig.9) one can see the painterly quality characteristic of Käsebier's gum prints. Just as Käsebier had a variety of techniques available for controlling the image tone of her platinum prints, she could control the image quality of her gum prints in multiple ways including; (a) her technique for hand coating the light-sensitive gum and pigment image material, (b) the manipulation of image material by brush during the washing process after exposure, or (c) by her paper selection for the primary support.

Gum-bichromate prints may be identified by their painterly quality and excellent image condition. Examination in raking light reveals a distinct dimensionality in which the pigmented gum arabic image sits proud of the paper support. Under 30X or greater magnification, their finely ground pigment particles may be visible. Unlike the platinum print, these final image materials are not embedded in the fiber matrix. Here, the deposition of pigments creates a pebbled texture in sharp contrast to the fibrous surface of the paper support. Paper fibers can be readily seen in the highlights where the unhardened gum did not adhere to the paper support during washing (see Fig. 10 and Fig. 11).

Fig. 10 Detail *Portrait of John Sloan*, 78.2.661. Gum bichromate print on medium-weight (8 microns) wove paper with slight texture.

Fig. 11 Further magnified detail of image in Fig. 13 to illustrate the height and texture of the pigment on the paper surface

Combined with visual microscopy, X-ray fluorescence spectrometry (XRF) may also be used in the identification of gum bichromate photographs. In doing so, the absence of silver or platinum salts may further affirm pigment-based photographic processes, such as gum or carbon. Likewise, the presence of additional elements may reveal the composition of traditional inorganic pigments used in the making of these print materials. The XRF spectrum below (Fig. 12) was taken from the *Portrait of John Sloan,* 78.2.661*.* The lack of a peak for any major metallic element suggests that the pigment Käsebier used for this print was carbon black. Carbon does not give a peak in XRF because it is below the detection limits of the instrumentation.

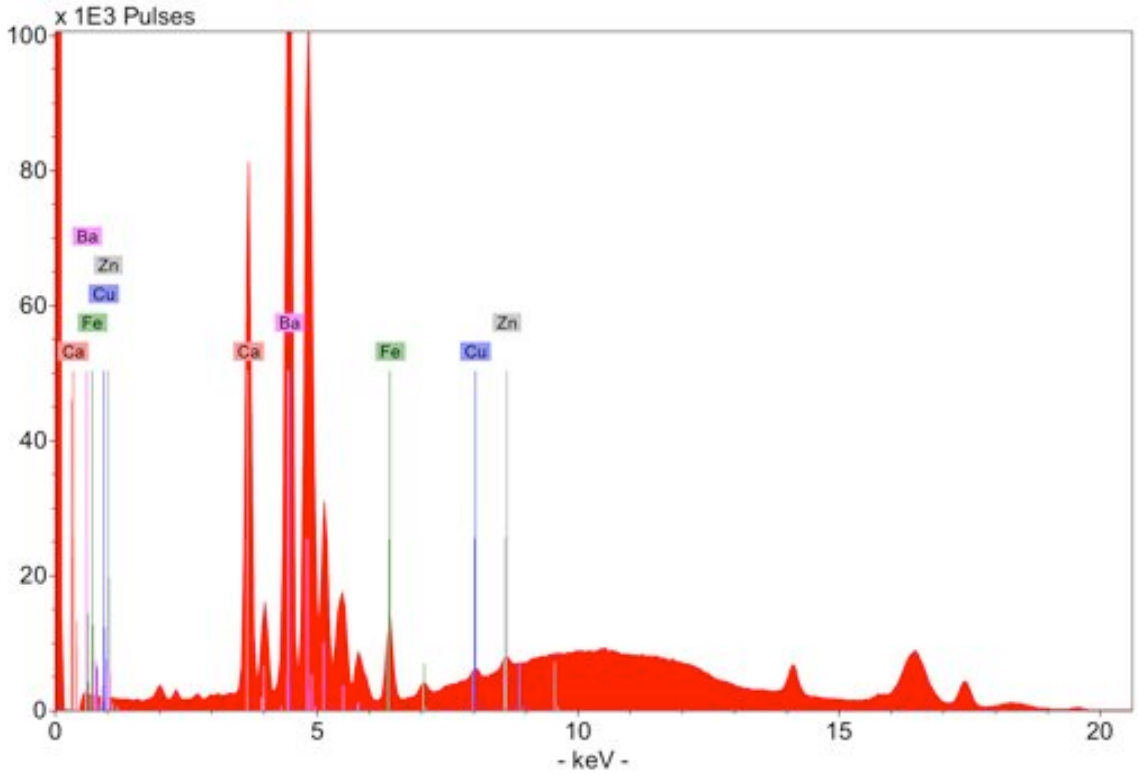

Fig. 12 *Portrait of John Sloan,* 78.2.661; Trace amounts of iron (Fe), zinc (Zn), and copper (Cu) can be seen in the spectrum as contaminants rather than intentional pigmentation materials. Barium (Ba) is a component of the paper support and likely gives it its bright white appearance in contrast with the deep, black carbon pigment that forms the image.

In selected photographic works, Käsebier achieved further distinction through superimposing a gum bichromate over platinum process to enhance richness and luminosity, a process pioneered by Edward Steichen and Alvin Langdon Coburn in America.

Owing to the permanence of the final pigmented image, gum prints, similar to their platinum counterparts, are typically highly stable, and rarely fade or discolor. Conservation treatment may include structural repair and compensation for loss; washing and other chemical interventions are uncommon and potentially destructive.

Photogravure

Though Käsebier did not work directly in photogravure, and the focus of this essay has been a discussion of her darkroom techniques, it is worth noting briefly that her images were reproduced and popularized using this photomechanical process to appear in Alfred Stieglitz's *Camera Work*, including *Dorothy*, *The Manger*, *Blessed Art Thou Among Women*, *Miss N.*, *The Red Man*, and *Serbonne*.

The photogravure process is an intaglio print making process that indirectly uses a photographic negative to create the final image. A printing plate etched with the photographic image is used to create many multiples of the same image much more rapidly than traditional photographic processes like platinum and gum bichromate printing. With the naked eye, these prints may appear to be platinum prints. However, under magnification, the image tone is not continuous, but has a worm-like pattern similar to other prints created by acid etching.

Long-term Preservation of Photographs

The Käsebier photographs in the University Museums' collection are in excellent condition. This is in part due to the inherent stability of the photographic processes she worked with, as discussed above, and also due to the care they've received at the University. The University of Delaware is one of only three institutions in the United States that educates and trains professional photograph conservators to conduct the examination, analysis, stabilization, and treatment of photographic materials. This training is provided through a Masters-level graduate program, the Winterthur/University of Delaware Program in Art Conservation (WUDPAC)[xi], jointly sponsored by the University of Delaware and Winterthur Museum.

For many years the University Museums and WUDPAC have had a strong collaborative relationship in which graduate students actively study the art and artifacts in the collections and when appropriate complete necessary conservation treatment for collection materials. The Käsebier collection has been a rich resource for research-based and hands-on preservation projects for students studying photograph conservation.

Proper handling and the careful storage and exhibition of photographs are essential for their longevity. Photographic materials must be housed and exhibited in a stable environment devoid of fluctuating temperature and relative humidity conditions, airborne pollutants, and ultraviolet light or high light levels. These conditions must be monitored closely. Environmental control is one of the most important aspects of photographic print and negative preservation.

Secondary to proper environmental conditions is the need for high-quality storage materials that come in direct contact with photographs, from storage envelopes to exhibition mats, these materials must be both chemically inert and physically harmless. All enclosure materials selected for photographic collections should conform to the requirements of the International Organization for Standardization (ISO) standard 18916:2007 and pass the Photographic Activity Test (PAT).

Conclusion

Understanding a photographer's oeuvre and working techniques strengthens our interpretation and preventive care of these at-risk materials. Many of Gertrude Käsebier's

well-preserved photographic prints in the University Museums' Collection at the University of Delaware exemplify the Pictorialist conventions popular in America and elsewhere at the turn of the twentieth century. Käsebier's cherished imagery, printed in metallic platinum and finely-divided earth pigments, achieves an iconic painterly effect that inspires today's scholars and public audiences.

Acknowledgements

The authors would like to sincerely thank photographer Jim Schneck for his time and skilled assistance in capturing the beautiful images used to illustrate this essay.

References

Gascoigne, Bamber. *How to Identify Prints: A complete guide to the manual and mechanical processes from woodcut to inkjet*, second edition. New York: Thames & Hudson, 2004.

George Eastman House. "Gertrude Käsebier/ Technique." *Notes on Photographs.* George Eastman House, 2009.
http://notesonphotographs.org/index.php?title=Gertrude_K%C3%A4sebier/Technique

Homer, William Innes. *A Pictorial Heritage: The Photographs of Gertrude Käsebier*. Wilmington: The Delaware Art Museum and the University of Delaware, 1979.

Jones, Bernard E. (ed.). *Cassell's Cyclopedia of Photography*. New York Arno Press, 1973.

Lavédrine, Bertrand. *A Guide to the Preventive Conservation of Photograph Collections*. Los Angeles The Getty Conservation Institute, 2003.

Maskell, Alfred and Robert Demachy. *Photo-Aqutint or The Gum-Bichromate Process: A Practical Treatise on a New Process of Printing in Pigment Especially Suitable for Pictorial Workers.* London, 1898.

McCabe, Constance, and Lisha Deming Glinsman. "Understanding Alfred Stieglitz' Platinum and Palladium Prints: Examination by X-ray Fluorescence Spectrometry." *Conservation Research 1995*, Studies in the History of Art, vol. 51, 71–85. Washington: National Gallery of Art, 1995.

McDarrah, Gloria S, Fred W.. McDarrah, and Timothy S. McDarrah. *The Photography Encyclopedia*. New York: Schirmer Books, 1999.

Nadeau, Luis. *Gum Dichromate and other Direct Carbon Processes, from Artigue to Zimerman*. New Brunswick, Canada: Atelier Luis Nadeau, 1993.

Nadeau, Luis. *History and Practice of Platinum Printing,* Third revised edition. New Brunswick, Canada: Atelier Luis Nadeau, 1998.

Pizzighelli, Captain and Baron A. Hubl. *Platinotype*. London: Harrison and Sons, 1886.

Vo, Tram M. and Dusan Stulik. "Working in Platinum: Gertrude Käsebier," *ICOM Committee for Conservation preprints*. Lisbon, 2011.

Bibliography

American Institute for Conservation of Historic & Artistic Works. *Code of Ethics and Guidelines for Practice of the American Institute for Conservation of Historic & Artistic Works*. Washington D.C., 2009.

Baldwin, Gordon and Martin Jürgens. *Looking at Photographs, a Guide to Technical Terms*. Los Angeles: The J. Paul Getty Museum.

Gernsheim, Helmut and Allison Gernsheim. *The History of Photography from the earliest use of the camera obscura in the eleventh century up to 1914*. London: Oxford University Press, 1955.

Lavédrine, Bertrand. *Photographs of the Past: Process and Preservation*. Los Angeles The Getty Conservation Institute, 2009.

Margolis, Marianne Fulton. *Alfred Stieglitz Camera Work, A Pictorial Guide*. New York: Dover Publications, 1978.

Nadeau, Luis. *Encyclopedia of Printing, Photographic and Photomechanical Processes*, vols. 1&2 A-Z. New Brunswick, Canada: Atelier Luis Nadeau, 1997.

Reilly, James M. *Care and Identification of 19th-Century Photographic Prints*. Rochester: Eastman Kodak Company, 1986.

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[i] Some of this research was conducted as part of a fall 2011 graduate-level independent study in photograph conservation as part of the Winterthur/University of Delaware Program in Art Conservation.

[ii] Typical to the working techniques of many Pictorial photographers, Käsebier often made glass plate interpositives from the original negative allowing for chemical and manual manipulation prior to making a copy negatives (sometimes further enlarged) from which her final prints would be contact printed. A significant holding of her negatives and interpositives can be found at the George Eastman House, Museum of International Photography (See George Eastman House 2009). Most of the prints in the University Museums' collection represent images slightly smaller than the whole plate size.

[iii] Barbara Michaels. *Gertrude Kasebier, The Photographer and Her Photographs.* (New York: Harry N. Abrams, Inc., 1992), pp. 117.

[iv] Willis produced three patents on platinotypes in 1873, 1878, and 1880 respectively. In his second patent he added lead salts (*plumbic chloride*) to the initial paper coating that he then abandoned in his third patent in 1880. He also founded the Platinotype Company in 1879, which produced the first commercially available platinum papers. Soon after many American manufacturers appeared, including Helios which Käsebier endorsed (See Nadeau 1998 and Norris in Homer 1979). Once Käsebier started printing her own photographs, she had access to all three of Willis' patents and a number of commercially prepared papers. Yet she often coated her papers by hand.

[v] Bernard E. Jones (ed.). *Cassell's Cyclopedia of Photography*. (New York: Arno Press, 1973) 417-421; and Gloria S McDarrah, Fred W.. McDarrah, and Timothy S. McDarrah. *The Photography Encyclopedia*. (New York: Schirmer Books, 1999) 362.

[vi] Gloria S McDarrah, Fred W.. McDarrah, and Timothy S. McDarrah. *The Photography Encyclopedia*. (New York: Schirmer Books, 1999) 360.

Although it eventually fell out of practice due to economic reasons, platinum and palladium printing experienced a revival in the 1970s in fine art and academia. Today platinotype kits can be purchased from specialized companies, such as Bostick & Sullivan. Martin Axon, Chuck Henningsen, and Sal Lopes, have printed photographs for renowned contemporary photographers, including Annie Leibovitz and Robert Mapplethorp (See Nadeau 1998, 52-55).

[vii] Constance McCabe and Lisha Deming Glinsman. "Understanding Alfred Stieglitz' platinum and palladium prints: examination by x-ray spectrometry." In *Research techniques in photographic conservation: proceedings of the conference in Copenhagen, 14-19 May 1995*. Eds. Koch, Mogens S., Padfield, Tim, Johnsen, Jesper Stub,.Kejser, Ulla Bøgvad. Det Kongelige Danske Kunstakademi. Konservatorskolen (1996), pp. 31-40.

[viii] W.E. Lee, Beverly Wood, F.J. and Drago, 1984. "Toner treatments for photographic images to enhance image stability." *Journal of Imaging Technology* 10:3: 119-126.

[ix] Tram Vo and Dusan Stulik. "Working in Platinum: Gertrude Käsebier," *ICOM Committee for Conservation preprints*. Lisbon, 2011.

[x] Like platinum printing, the success of gum printing is the work of many scientists and experimenters. Mongo Ponton is credited with discovering the light sensitivity of dichromate in 1838, and Henry Fox Talbot noted that soluble organics, such as gum arabic, become insoluble when combined with dichromate. In 1855 Alphonse Louis Poitevin added pigment to the gum arabic and dichromate mixture, making the creation of an image possible using this process. He produced the first patent for his discovery on August 27, 1855 (See Nadeau 1993 and Maskell 1898).

[xi] WUDPAC trains professional conservators in eight disciplines including furniture, library and archives materials, objects, painted surfaces, paintings, photographic materials, textiles and works of art on paper. For more information about the Winterthur/University of Delaware Program in Art Conservation visit the program's website at: www.artcons.udel.edu