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Alfred Stieglitz: Photographic Processes and Related Conservation Issues

Rachel Danzing

Alfred Stieglitz (1864-1946) played an important role in the establishment of photography as a fine art form at the beginning of this century. Through his numerous publications, exhibitions, and vocal protests he sought to convince the American public that photography possessed its own unique means of expression and should be subject to the same criticism as other areas of fine arts. Although his efforts were very influential in the establishment of photography at the beginning of this century, only recently has there been much examination of Stieglitz's own photographic work (34, p. 12). There is little documentation on his working methods, although recent publications indicate a growing interest in the subject. Many photographic conservators and historians, however, are working on specific problems associated with some of the Stieglitz prints and others have a great deal of experience with the treatment of his photographs. Those who generously shared their time, knowledge, and experience with the Stieglitz prints included Betty Fiske at the Metropolitan Museum of Art, Debbie Hess Norris at the Winterthur/University of Delaware Art Conservation Program, Doug Severson at the Art Institute of Chicago, Nora Kennedy, a private photographic conservator, Jose Orraca, a private photographic conservator, and others too numerous to mention here. I have gathered and documented the information culled from these sources of expertise in an attempt to determine the degree to which Stieglitz's intentions were purely esthetic or due to technical considerations alone; but mostly, the study serves as a reference source to some of the techniques possibly used by Stieglitz in order to gain a better understanding of the conservation problems encountered with his prints. Some ethical questions arising from these problems are also discussed.

I consulted Stieglitz's correspondence to Paul Strand in the Stieglitz Archive at the Beinecke Library of Rare Books and Manuscripts, Yale University, his scrapbooks (at the Museum of Modern Art), his writings (especially in Camera Notes and Camera Work), and periodicals contemporary to his time, and this information was incorporated into the study. Although his letters are not highly technical, they do give us clues as to what his intentions may have been at a certain point in time. Most importantly, they give the reader access into the pysche of Alfred Stieglitz--of what he might have approved or disapproved. Amusingly, Stieglitz combined many thoughts simultaneously, often mentioning a particular paper he may have been using, the state of his health, and an update on the weather all within a single sentence.

I began my research by concentrating on Stieglitz's portraits of Georgia O'Keeffe between 1917 and 1937 because a number of sources indicated preservation problems with the some of the pieces within this period, but the study has expanded and my research has overlapped into other works.[1] I have also c concentrated my study on photographs from The Metropolitan Museum of Art and The Museum of Modern Art in New York. Here again, there is some overlap into other collections.

In 1917, "291", the gallery where Stieglitz had exhibited the works of the Photo-Secessionists and other modern American and European artists, closed and the last issue of Camera Work was printed. By this time photography was well on its way to becoming an accepted art form and modern European and American art had established a foothold in this country (33, p. 14). For the first time since the beginning of the Photo-Secession, Stieglitz was not immersed in exhibition work, enabling him to concentrate on his own work (13, p. 17). Most of the photographs made at this time were taken and printed at his family's summer house at Lake George, New York, at which time Stieglitz began to pursue many of the ideals which he had developed during his years at "291".

In Stieglitz's early days as a photographer, especially as a student in Germany under Hermann Vogel, he experimented with many different photographic processes including the use of orthochromatic plates, carbon and gum prints, platinum prints, and platinum-toned aristotypes, which were printing-out collodion or perhaps printing-out gelatin silver papers.[2] Stieglitz continued to experiment in the darkroom with a wide range of media and papers, but he was no longer as interested in technical virtuosity as he had been in his earlier days. For Stieglitz, materials and techniques played an integral role in achieving a

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[1]There are 300 separate images of the O'Keeffe portrait series out of approximately five hundred existing negatives (13, p. 18).

[2]American Aristo and Aristo Self-Toning Papers were collodion printing-out papers made by Eastman Kodak, mentioned in the 1905 Kodak manual, The Modern Way in Picture Making 1905, (27, p. 115). Josef Eder mentions in his History of Photography that "aristo" paper was a silver chloride, printing-out emulsion paper (a gelatin, printing-out paper) which came about with the development of the dry plate (28, p. 536). For more information on aristotypes, see Bertrand Lavedrine's article, "Study of the Microstructure of Silver Grains in Gelatin Printing-out-paper after Accelerated Aging," to be published in Topics in Photographic Preservation, Volume 4.

desired effect or intensity of feeling in his prints, but he felt that manipulation of technique for its own ends was invalid and detrimental to the vitality of the photograph. In fact Stieglitz's technique was not always careful, and his somewhat freeform or "sloppy" procedures may be the cause of some of the preservation problems now encountered with his prints.[3] Stieglitz's aim was to convey the essence of life, "all that I feel in life" within a single print, (33, p. 109) (54, p. 3). He frequently expressed frustration in his letters over his attempts to approach perfection, often making many prints from a single negative only to get a few acceptable results. Carl Zigrosser mentioned in his 1942 essay in Twice-A-Year: "...it is true that he has a profound feeling for materials and a passion for excellence that leads him to untold expenditure of time and energy. In his photographs, as far as is humanly possible, there is perfection and the completest realization of his intention. Every possible factor of light, atmosphere, temperature, chemicals, paper, and the like, is consciously considered; any lucky accident is immediately seized and taken advantage of" (74, p. 140).

During the Photo-Secession years Stieglitz often printed on platinum paper. During World War I, however, platinum became very expensive and difficult to obtain, at which time Stieglitz began to experiment with other papers including palladium and gelatin silver. Printing of palladium is very similar to platinum and can be very similar in appearance as well. Both platinum and palladium use iron salts as their light-sensitive component and both are one-layer prints where the metal image is formed in the paper fibers of the support. The two processes are generally very stable, (64, p. 62) as stable as the paper support, due to the resistance of the metal to tarnishing and oxidation. Some of the questions in dealing with the O'Keeffe portraits lie in the difficulty in distinguishing these two processes, compounded by the considerable manipulations to which the two processes can be subjected.

Platinum prints generally have a neutral black image color with a wide range of tonal values, especially in the middle grey tones. Its color can range, however, from a blue-black to a brown (64, p. 24). Palladium prints tend to have warmer, browner tones. The shadows are more intense and the highlights are often yellowed, although it can be difficult to tell if this is caused by the deterioration of the paper support. However, as pointed out by Luis Nadeau, "with the right developer, at the right temperature and on appropriate paper, it is possible to obtain a palladium image that is nearly identical to that of a platinum print" (49, p. 30). The paper support of both platinum and

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[3]From a discussion with Denise Thomas, a paper conservator formerly at the Philadelphia Museum of Art.

palladium processes can yellow and deteriorate due to iron salts remaining in the paper, insufficient washing out of the acid from the clearing bath, or poor quality material paper (58, p. 71).

In addition to these processes, in the late 1910s and early 1920s Stieglitz frequently made prints on gelatin silver papers. In a 1923 article by Charles Sheeler, "Recent Photographs by Alfred Stieglitz," Sheeler mentioned that Stieglitz was using gelatin silver papers, which Sheeler like very much, due to the scarcity of platinum (69, p. 92). A gelatin silver print consists of three layers--a paper support, a substrate, or baryta layer, and a silver image in a binder (gelatin) layer (64, p. 68). The baryta layer in these papers is beneficial; it enhances the optical properties of the print and serves as a protective layer between the coating and any impurities in the paper. In addition, this layer allows for more control over the surface character of the print and can shield the paper underneath from light damage (64, p. 9, 29).

One can generally distinguish visually or with the aid of a microscope, whether a print is platinum, palladium, gelatin silver (sometimes the baryta layer can be seen under the microscope), or a gelatin silver emulsion containing platinum or palladium (due to a combination process). Some papers, however, were manufactured to emulate the effects of other papers and their appearance can be misleading. For example, while the use of platinum was phasing out, some gelatin silver papers were manufactured to micmic the subtle tones of a platinum print, often with "Platino" in them. Platinotypes and palladiotypes from the early twentieth century may be difficult to distinguish from matte gelatin bromide papers of this time because prints were frequently manipulated during development, often with the addition of toners to produce different tonal effects. Other possibilities for manipulation of a print was the use of a cold bath developer which produced cooler tones, and a warm bath developer which produced warmer tones. To complicate matters, other variables could influence the appearance of a print such as light exposure, type of development, fixer, coatings, paper supports, storage, and usage history. It is therefore difficult to make generalizations about Stieglitz's prints since each is unique and individual in character.

In addition to its appearance, the collection in which an image resides determines how it exhibited and treated. Issues of quality and singularity commonly arise in the present-day art market, stemming from the search for a prototype or "unique" image. A dealer who is dealing in the private art market may chemically treat a print in order to give it the desired "new" look, while museums or fine arts collections often have different concerns; photographs are esthetic images and are displayed one by one. Other types of collections include the George Eastman House and the Library of Congress, which contain fine images but

tend to encompass the entire history of photography. At the National Geographic Society, photographs are collected for their historical context, and for reproduction, but fine arts prints are found as well. In historical societies and archives photographs are often used for information purposes. In an attempt to preserve the original integrity and history of a print, a museum or archive conservator will often choose to preserve and stabilize the print, rather than visually restore it.

One way to conclusively determine the elemental composition of a print is through the elemental analysis technique of x-ray fluorescence, or XRF, a technique generally and widely used. When a sample is irradiated with x-rays the atoms of the sample are excited and give off radiation characteristic of the element sampled. This technique can detect many elements at very small levels, is non-destructive, and leaves no radioactive residue on the print (30, p. 99). Certain elements are found in most black and white prints: iron, copper, and lead, which may be components in mounting tissue; silver, if the print is a gelatin silver print; barium, if it is a commercially-made gelatin silver print; and platinum or palladium if it is a platinotype, palladiotype, or platinum- or palladium-toned silver print. Barbara Miller, a conservation scientist, and Katherine Nicholson, a paper conservator, both formerly at the National Gallery of Art in Washington, performed XRF analysis between 1981 and 1983 of Stieglitz prints which helped in identifying their processes. An example of a Stieglitz print analyzed in this series, showed minor constituents of platinum and trace constituents of gold, copper, zinc, and iron, which identified the print as a gold-toned platinum print. Presently, however, I have found no XRF system used for routine analysis of photographs due to time and financial constraints (27, p. 103-4).[4]

Conservation treatment of photographic prints raises some interesting ethical questions due to the relative newness of the field, only one hundred and fifty years old, in comparison to other areas of art conservation. The effects of chemical treatments are not yet fully understood and tend to complicate the long-term history of a piece. Most conservators consulted rarely treated any print chemically, including treatments involving water, and most conservators are hesistant to experiment with the Stieglitz prints. Some work has been done by private conservators who are dealing with the private art market, but most of the treatment emphasis lies in preventative care.

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[4]Some XRF analysis was done at The Metropolitan Museum of Art in the early 1970s by Gary Carriveau to discern platinotypes from palladiotypes, but Stieglitz prints were not tested.

Some problems observed on prints by Stieglitz include those which have discolored and turned yellow due to a wax or shellac coating. Luis Nadeau mentions that Stieglitz and other photographers commonly waxed their prints for added gloss, brilliance, and increased intensity in the dark areas of the print, yet the coating tended to yellow the paper over time (49, p. 53). Although the coating can change the image over time, is it ethical to remove it even though its application was a conscious choice of the artist? Should the conservator consider it a part of the work itself, or should one regard this coating as one would a discolored varnish on a painting? Other problems include prints which exhibit pink staining, a problem observed on some prints at the Philadelphia Museum of Art. This staining may be caused by the rubber cement with which Stieglitz mounted his prints. Denise Thomas, a paper conservator formerly at the Philadelphia Museum of Art, stated that the sulfides in the rubber cement penetrate the support and have caused staining in some of Stieglitz's prints. Improper processing--inadequate washing or the use of exhausted fixer, can cause yellow and brown staining, observed on some of the Stieglitz gelatin silver prints. The question arises whether or not to rewash or refix prints for which this treatment would be considered helpful. Unfortunately, not much is known about how these treatments will affect the entire print; what is beneficial to the coating of the print may not be good for the baryta, emulsion, or substrate layers below and vice versa. Even if a treatment is considered safe, ethical questions arise because microscopic image metal may be removed in treatment.

Doug Severson had encountered problems on Stieglitz prints which were treated by Edward Steichen in 1949 and 1950. Fifteen to twenty of the Art Institute's portraits of O'Keeffe are clearly yellowing.[5] In August 1989, he performed x-ray fluorescence analysis at the National Gallery of Art in Washington on several prints which were exhibiting discoloration from both the Art Institute of Chicago and the National Gallery of Art[6] and found that all the prints which had been treated by Steichen were palladium prints.[7] Severson posited that Steichen

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[5]Much of this information comes from discussions with Doug Severson, who is working on the problems found on Stieglitz prints which were treated by Edward Steichen.

[6]XRF analysis done in August 1989 in the conservation department of the National Gallery, Washington by Leisha Glinsman.

[7]Severson examined letters to the Art Institute from Doris Bry that discussed Bry picking up the prints from the Museum and bringing them to Steichen, and mentioning that it is the sensible thing for them to do. Another letter from O'Keeffe to the

may have mercury-toned the prints, for addition of bromide of mercury or mercuric chloride to the developer or sensitizer was a common practice in the treatment of platinum prints to achieve a warmer brown tone than was available with commercial, sepia-toned papers (58, p. 70). In his analysis no evidence of toning was found, except for one print which showed a mercury peak.[8] The XRF analysis performed by Miller and Nicholson at the National Gallery, however, did support Stieglitz's use of mercury toning; many were found to be platinum or palladium prints toned with mercury.

In unpublished notes from an interview at the Philadelphia Museum with Richard Benson, a photographer who worked with Paul Strand after 1975 printing many of his negatives, Benson stated that Steichen reprocessed Stieglitz's prints with 1/60 parts HCl solution, then washed and rewaxed them (8, p. 5).

In Joseph Keiley's article on the use of glycerine in the development of platinum prints, Camera Notes (April 1900), he states "Very beautiful effects can be gotten through the use of mercury-bic. in combination with the ordinary developer, as suggested by Mr. Stieglitz....The mercury is a very uncertain quantity and rarely acts in the same way twice, so that one must use it with great caution. As the tone produced by its use is of a more or less transparent character, development with the co-operation of the salts of mercury can be carried much farther than is the case with the developing solution containing no mercury, as the shadows will not be clogged and opaque." (42, p. 225). Intensification with bi-chloride of mercury, after the print was washed, was used to heighten the contrast of the print (27, p. 44) as well as function as a toner.

Beaumont Newhall stated that Stieglitz intensified his negatives in the 1930s with mercuric chloride after development: "If a negative showed little detail in the shadows, you simply bathed it in water and then brushed the areas that were too weak." Jose Orraca stated that Stieglitz may have used this technique on old gelatin glass plate negatives to render more contrast, even though this might dissolve the gelatin.[9] In fact, Newhall stated: "The chemical is deadly poisonous. But worst was the fact that it dissolved the gelatin layer...Many of

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director of the Art Institute discussed how wonderful the treated prints looked (Conversation with Doug Severson, April 25, 1989.)

[8]The XRF analysis was done with a barium detector which does not detect uranium, among other elements.

[9]Information through personal communication in January 1991.

Stieglitz's became jelly..." He stated that Strand used the technique as well.[10]

XRF alone cannot ascertain the cause of yellowing of a print. The Steichen-treated prints may have exhibited problems to begin with causing them to be sent to Steichen for treatment. Perhaps, due to poor processing, they were treated and are now reverting back to their original state. Stieglitz may not have cleared his palladium prints well enough, he may have used a very hot developing bath, he may have used a different surface coating, or there may be a completely separate deterioration mechanism inherent within the palladium process (68, p. 42).[11]

Many conservators have encountered another interesting issue when dealing with some of the Stieglitz prints. Stieglitz would dry mount a "bad" print on the back of a good, or finished, print, presumably to cut down on curl. Beaumont Newhall confirms this: "...he drymounted a discard print back to back with a good print--the idea being to keep the print flat." Grant Romer at the Eastman House had observed Stieglitz prints mounted back to back in his collection, and had seen a picture of Stieglitz mounting his prints in this way.[12] Many conservators have been asked to take the prints apart so that they can be viewed and sold separately. The Eastman House had one of these prints stolen, a silver gelatin print, which was later regained, but the prints had been taken apart. After the prints were recovered, it was debated whether or not to remount the prints or leave them as they were. Besides the natural ethical questions which arose, it would have been difficult to remount them, so both are now in separate storage. Unfortunately the photographs have lost some of their meaning, yet the separate prints have acquired interest historically and esthetically with time.

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[10]Information from Newhall was contained in a letter of May 14, 1989 to the author.

[11]Unfortunately, XRF cannot identify the chemical state of the elements. There is difficulty with with XRF in distinguishing between toners and base metallic image. In addition, XRF does not determine when a toner was applied--it may have been put on at a later time by someone other than the artist.

[12]It is likely that photographers were advised to mount their photographs on photographic paper because the paper was supposed to be of a high quality. This was not necessarily true, for some papers were of low quality and acidic materials.

The following section of this paper attempts to further describe materials and processes available which Stieglitz may have or is known to have used.

The first platinotype process was developed by William Willis in 1873, known as the hot-bath method because of the temperature of the developing bath. William Willis founded the Platinotype Company in London in 1880 to manufacture platinum paper and developed the cold-bath semi-developing out process in 1892. The platinotype is a semi-developing out paper where the metal salts are reduced when exposed to sunlight, but the image only appears after development. In October 1887 Captain Pizzighelli developed a process where the developer was in the sensitizing solution, eliminating the need for subsequent development.[13] This paper, the first printing-out platinum paper, was called Dr. Jacoby's Platinum Printing Out Paper (35, p. 5-6, 10) and was used by Stieglitz as early as 1887. A printing-out paper is a silver chloride paper in which the image appeared by exposure to sunlight, without development. The print is then cleared and washed. These Pizzitypes were manufactured by Dr. Ad. Hesekiel and Dr. R. Jacoby in Berlin (49, p. 15) and gave yellowish-brown sepia tones. According to Richard Benson, Stieglitz only used platinum printing-out papers while he was working in Germany. Beaumont Newhall mentioned that Stieglitz "surprised Vogel by working out a way of toning 'aristotypes' with platinum, which was much less expensive than using platinotype paper."

The Platinotype Company's platinum paper was distributed in the United States by Willis and Clements of Philadelphia. By 1911, the Platinotype Company was distributing fifteen varieties of platinum papers in America, mostly with matte surfaces. Stieglitz mentioned ordering from "W & C" in letters dated July 27, 1920 and July 14, 1927. Various tones and surfaces were available: AA smooth, BB semi-matte, and CC rough texture (35, p. 6).

Willis and Clements dominated sales of the paper up until 1906 when Eastman Kodak began to produce platinum paper. American Aristotype Company, which later became part of Eastman Kodak, also made platinum paper in smooth and rough surfaces and medium, heavy, and extra-heavy weights. The firm Joseph

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[13] This paper had to be sensitized by the photographer with a solution of potassium chloroplatinite, ferric oxalate, oxalic acid, potassium chlorate, and distilled water. The platinum salt was reduced to form the platinum metal image during exposure to light and the latent image was developed in a saturated solution of potassium oxalate. The print was then cleared in hydrochloric acid to etch away the iron and washed in water to remove any remaining acid (57, p. 68).

Di Nunzio in Boston developed a platinum paper called "Angelo" paper. They were bought out by Kodak who marketed the paper under the same name in 1906 (35, p. 6). Stieglitz did not mention this particular paper, but it is advertised in Camera Work (Jan. 1911), and mentioned in Kodak amateur manual, The Modern Way in Picture Making (1905), in which Stieglitz published an essay, "Simplicity in Composition," as a "pure platinum, semi-developing paper." (27, pp. 161-4) Full development was accomplished by immersing the print in "Angelo Sepia Developing Solution" (27, p. 126-7). In 1909, Kodak produced Etching Black Platinum Paper and Etching Sepia Platinum Paper in 1910 (35, p. 6). Eastman's Sepia Paper is mentioned in Kodak's 1905 manual (27, p. 121) and again in Camera Work (Oct. 1913). Stieglitz mentioned using Black Platinum paper and a "KK" paper, perhaps a platinum paper, in letters of April 27 and May 20, 1919.

During WWI, the demand for platinum paper diminished as the cost of platinum salts escalated and Stieglitz probably found it difficult to obtain platinum papers. By 1916, Kodak stopped making platinum paper (35, p. 6). Stieglitz seemed to have been making mostly gelatin silver prints in the latter part of the 1920s, but in his letters he mentioned using platinum from 1915 to 1927, almost until his last letters to Paul Strand, although not as often between 1915 and 1918. After World War I, especially in his letter of September 24, 1921, Stieglitz complained about the poor quality of the platinum paper he was using. O'Keeffe recalled that platinum papers made before World War I were not made after the War. She remarked, in particular, about a beautiful black platinum paper: "No black surfaced-paper was made at that time [after the war]."[14] She stated that Eastman Kodak began to increase quantity and decrease in quality (70, n.p.). The Platinotype Company, however, commercially produced platinum papers in England until 1937 and platinum paper stopped being manufactured altogether in 1941 (35, p.6).[15]

In 1916, the Platinotype Company began to produce a less expensive Satista paper, a silver-platinum paper containing a small amount of potassium chloroplatinite to aid the ferrous oxalate in the reduction of the silver chloride (49, p. 15). Satista paper was a type of Japine paper, a smooth, semi-matte platinum paper manufactured by the Platinotype Company, coated with a gelatin emulsion coating or other topical coating and available in black or brown tones. Luis Nadeau mentioned that

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[14]O'Keeffe may be referring to Kodak's Etching Black Platinum Paper or Etching Sepia Platinum Paper.

[15]Strand and Gilpin continued to privately import platinum paper until it was no longer manufactured. Gilpin also made her own platinum papers.

"Japine" was a brand of platinum paper coated with a "supercoating." This paper, along with many other brands, was distributed by Willis & Clements beginning in 1911 (49, p. 14). Stieglitz wrote of using Japine in his letters of September and October 1920. In his letter of October 22, 1920, he stated that "platinum prints on Japine lose their refinement when waxed."

On Satista paper, the image is composed mostly of silver with a little platinum, which formed the details of the print. In a 1916 British photographic journal, it was advertised as being available in two tones--black, from a cold-bath developer, and sepia, from the same solutions at a higher temperature (160-170°F). The Satista paper was distinguished from Japine paper: "The results [of Satista] are indistinguishable from those on the platinum Japine papers, whilst the permanency of the prints is hardly inferior to that of those by the platinum process."; or: "Of the two grades of "Satista," black and sepia, both are coated on semi-mat hard-surfaced paper similar to Japine." (11, p. 396, 398, 471).

Strand is known to have used Satista paper around 1916, but it is questionable whether or not Stieglitz actually used it. The only reference found indicating Stieglitz's use of this paper is a 1917 portrait of Strand identified as a "Satista print" on the verso of the print (30, p. 113). Betty Fiske stated that Satista paper is easily distinguishable because of its many flaws due to the incompatibility of its layers, and required a lot of retouching. It may also exhibit silver mirroring in the dense areas of the print.[16]

Palladium paper was introduced by the Platinotype Company around 1916 and was two to four times less expensive than platinum (49, p. 15). Stieglitz mentioned "Palladios" often in his letters from 1918 until 1924 (after which the letters are few). O'Keeffe wrote that Eastman developed a palladium paper which was a very pale brown color. Often these papers, on "parchment paper" were damaged and she stated that Stieglitz complained profusely. Later she stated: "a darker brown paper was made--and finally there was a black palladio. It was better but not in the same class with the black platinum paper that was made before" (70, n.p.). Up until 1920, Stieglitz vigorously complained about the inconsistencies of Palladios in his letters, but he seemed to have gained control, or perhaps familiarity, with the process in 1921. Stieglitz did much experimenting with the different kinds of palladium papers commercially available. For example, in 1918 he mentioned that he liked platinum better,

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[16]No Satista prints by Stieglitz have been noted at the Metropolitan Museum of Art.

but he liked the directness of palladios.[17] In a letter from April 27, 1919 he stated that certain negatives are good on KK, while other negatives are better on Palladio. In September 1920, Stieglitz wrote that he liked the "new (palladium) paper" better than the "old." In August 1922, it seemed that Kodak again changed their palladium paper, which Stieglitz did not like at all. He wrote of having to get paper from England because the new Palladio paper had been delivered with bad cracks. The palladium papers Stieglitz wrote of using were Palladio Black (March 28, 1919): "like blotting paper, but okay.." and Sepia Palladio (April 27, 1919). He stated that he liked the Sepia paper with the Black developer. He continued to mention the Black and Sepia papers up until 1922 (he mentioned the Black Buff Palladio in September 2, 1922), but may have continued to use them until much later. (Stieglitz did not mention specific papers in many of his later letters.)[18]

At this point in my research, I find it difficult to make generalizations about Stieglitz's esthetic preference for his choice of one process over another. I believe that he began to use the palladium paper out of necessity and convenience; but, the frequency with which he mentions Palladios in his letters to Strand from 1918 until his final letters to him, indicated he was using this paper often, though not to the exclusion of platinum papers. His consistent, from 1915 on, albeit infrequent references to platinum, indicate that he either preferred using platinum when possible, or that he was merely appealing to Strand's preference for this technique.

Stieglitz often wrote about the weather when determining whether or not he would be able to print. His references to the weather are curious and may have referred to the fact that platinum papers are very sensitive to dampness and therefore were packed in sealed cans or tubes (27, p. 122). Stieglitz may be have been referring to the use of gelatin silver printing-out papers which were exposed by daylight, or perhaps he was only expressing his mood at the time.

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[17]Stieglitz may have been referring to the fact that, in general, palladium printing is 2 1/2 times faster than platinum printing. This would make manipulation of a palladium print during development more difficult than for a platinum print, which could be further slowed down by development with glycerin. It was also possible to slow down the development of palladium using certain light sources (49, p. 30).

[18]It is possible that the Black and Sepia Palladium papers contained the toner in the paper itself, i.e. the toner was attached to the metal in the top layers of the print. This possibility was discussed with several of the people conferred with on this paper, and different opinions were received.

In a letter of June 11, 1915 to Charles Sheeler, Stieglitz wrote that he had not tried the "Artura" paper yet, but that he hoped to. Richard Benson stated that Artura Iris paper was a silver chloride, gaslight paper, manufactured to mimic the tonalities of a platinum paper. A gaslight paper was a slow-speed developing out paper that was chemically developed by turning up the light of a gas illuminator (used at that time) and placing it near the printing frame to expose the negative. To process the print, the flame was lowered and held near the trays. All gaslight papers were silver chloride or silver chloro-bromide gelatin papers on a baryta layer (64, p. 13). This paper allowed the photographer to print indoors under any weather conditions and had the advantage over daylight development (printing-out papers) because the process allowed for the control of the light intensity. In addition, a very dark room, needed for silver-bromide papers, was not necessary (47, p. 26). In a letter of October 17, 1918 Stieglitz stated that "he does not like the Gaslight papers at all, nor does he like the Artura that Sheeler uses, but seems to think it is okay for what Sheeler is doing." He also stated that Sheeler was using bromide papers which he admired for their smooth quality, but he did not like them for his own "queer negs." In July 1925, Stieglitz wrote of a paper called Vitava,[19] which he thought was inferior to Artura. Stieglitz wrote in a letter of October 1921 that he was beginning to experiment with gaslight papers because it had been raining, and again in June 1922. (Again, Stieglitz may be have been referring to the lack of sunlight or the presence of moisture in the air.)

Velox paper was a popular semi-developing out paper first introduced in 1894 (47, p. 26) and can be identified by the "Velox" logo printed on the back of the paper. This paper was mentioned in the Kodak manual The Modern Way in Picture Making 1905, as: "a developing-out paper which can be printed at any time, by any kind of light, from any negative." It could be printed by either artificial or daylight and was then chemically developed (27, p. 95). Velox, mentioned in current periodicals (Camera Notes, vol. 5, no. 1), and (Camera Work, Jan. 1913), was generally cut to size for use by amateurs, but I have not yet identified prints on this paper by Stieglitz.

Stieglitz preferred low contrast and warm-toned neutral black papers over high-contrast papers (59, p. 1). Benson stated that Stieglitz often exposed his papers to light before contact printing, or "flashed", his gelatin silver papers to eliminate white highlights. Stieglitz initially may have achieved this effect accidentally, and continued flashing to achieve similar results. Stieglitz also preferred smooth, matte papers. Benson mentioned that he used a Kodak "E" paper, a matte, gelatin silver

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[19]No further information on Vitava was found.

paper with an orange peel texture (8, p. 2). As mentioned above, many types of papers were available which provided a range of tones.

Stieglitz also mentioned the paper Viridin (in a letter of August 9, 1915) and azo paper, a fairly warm-toned paper. Bob Lyons stated that Stieglitz used azo paper for gelatin silver prints (8, p. 1). Richard Benson stated that the paper is a silver chloride paper. In the 1905 Kodak manual, azo is described as a silver chloride print which should be developed in Amidol and which: "...may be exposed the same as Velox." (27, p. 105). According to Beaumont Newhall, Stieglitz was using "the simplest of printing techniques--Kodak's Azo paper when Newhall met him in the 1930s.[20] Newhall states that Stieglitz "was proud that the Equivalents were made with this quite ordinary paper and boasted about using a 'M-Q' developer, like any amateur (including me!) would use. We bought for 5 cents tubes with a stopper in the middle. One end held hydroquinon powder, the other metol. You just dumped these in a beaker of water." Stieglitz wrote in a letter of August 1924 that Kodak had softened the azo(l?) stock and emulsion quality.
If one goes back through references or advertisements of the time, a vast amount of photographic paper names can be found.[21] Many papers were available before 1917--many other types became available in the years between 1917-1937, which may or may not have been used by Stieglitz.

In a letter of October 13, 1919, Stieglitz wrote that he was able to get less solarization on the "vellum" paper.[22] Solarization is defined as "A reversal of tones caused by massive overexposure of photographic materials", and usually refers to a print, rather than a negative. The term "solarization", however, is mistakenly and commonly used to describe the Sabattier effect, which is "A partial reversal of tones caused by re-exposure to light during development of film or paper (73, p. 41-2). Solarization can cause a loss of detail and the formation of black outlines around light areas. Benson stated that Stieglitz overexposed his platinum and palladium prints by contact printing them in daylight for exposure reversal to creat black outlines

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[20]From a letter of May 14, 1989 to the author.

[21]More research needs to be done on this topic, but I would refer those interested, to look through these sources and the sample paper collections at the Eastman House, discussed in Barbara Brown's article in Topics in Photographic Preservation, Vol. 2.

[22]This "vellum" may be the palladium "parchment paper" to which O'Keeffe referred in A Portrait of Georgia O'Keeffe. See Reference section.

and tonal graininess (8, p. 5). In Photography: Essays and Images, Newhall illustrated the autograph note on the back of Hands and Thimble--Georgia O'Keeffe, 1920, a palladium print at The Museum of Modern Art, New York. The note stated: "--(Historical note). first use of solarization as an integral part of a picture." (51, p. 216) This image is slightly unfocused and a black outline is visible around the image. Hager stated that it was unlikely Stieglitz solarized his negatives, although perhaps by accident, because in general, solarization was difficult to control. Stieglitz may have been referring to the use of solarization in his letter of October 13, 1919.

When printing gelatin silver prints, Benson stated that Stieglitz would overexpose his negatives for highlight separation and underdevelop the print in a dilute developer to achieve grey, soft blacks.[23] O'Keeffe wrote that Stieglitz used glass plates "in the beginning" to photograph her; the plates were very slow and that she found it difficult to remain still for three to four minutes without moving (70, n.p.). Sue Davidson Lowe, in her biography of Stieglitz, also remembers the difficulty of staying motionless for three to four minutes, and says that Stieglitz often demanded an hour from his sitters (45, p. 179). Small movements of his sitters may account for blurring which is often seen in Stieglitz's portraits. To further manipulate the development of his prints, Stieglitz would often use a very hot developing bath, which would produce a warm image tone. (In theory, the warmer the bath, the warmer the image tone.) In a letter of August 14, 1917 Stieglitz wrote of using a developer and fixing bath of 92°F.

Stieglitz was very familar with various toners from his extensive technical training as a student in Germany. Printing out papers, used by Stieglitz in Germany, generally have a warmer image tone than developing out papers, and almost all were toned with gold or platinum or both. Benson stated that Stieglitz probably was "too lazy" to tone his gelatin silver developing-out prints. In the group of Stieglitz prints analyzed at the National Gallery of Art by Miller and Nicholson (from only a sample of Stieglitz prints), only one print, Hodge Kirnon from 1917 was found (probably) to be a platinum-toned silver print. Platinum toning can turn the silver image brown, further complicating media identification (64, p. 24).

Toning was often accomplished by immersing the finished print in another developing solution to "bleach out" the silver

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[23]Several dark prints probably done in this manner were observed at the Metropolitan Museum of Art. Michael Hager, a photographer and formerly the negative archivist at the Eastman House, also mentioned that Stieglitz was famous for his long exposure times.

which was then followed by an additional fixing and washing bath (26, n.p.). The most common metals used to tone gelatin silver prints were gold, uranium, selenium, platinum, and sulfur. Sepia tones, for example, could be achieved with a sulfide toning bath, where the silver was converted to silver sulfide. A 1929 article in The Photographic Journal described sulfide toning in detail (7, pp. 509-513). Problems of extensive yellowing of sulfur-toned gelatin bromide prints were noted in a 1932 article in The Photographic Journal which stated that excessive yellowing could be avoided if the prints were thoroughly washed before and after bleaching (39, pp. 480-5).[24] Advertisements for some papers such as Mezzotone papers, a gelatin silver paper, claimed to "give pleasing brown prints." (27, p. 117).

As mentioned above, Stieglitz toned his platinum and palladium prints with mercury to produce warmer brown tones than those ordinarily achievable with a hot developer or commercial sepia toner (58, p. 70). The use of glycerin, mentioned in Keiley's article in Camera Notes (1900), may also alter the color of a print. Nadeau mentioned in his book, History and Practice of Platinum Printing, that the use of glycerin may add a brownish tone to a print (49, p. 57).

Uranium was also commonly used to tone platinum prints. No uranium was found on the small group of prints sampled at the National Gallery in 1981-83, but Jose Orraca, stated that some Stieglitz prints may have been toned with uranium. In R. Child Bayly's 1932 book, The Complete Photographer, a method of toning platinum prints was described, developed by J. Packham, of which Stieglitz may have known. The process involved immersing the finished print in a solution of a vegetable dye called catechu. The dye could react with the iron salts, which remained in the paper from the developing solution, and cause the image to become gradually brown (5, p. 192). A 1916 article from The British Journal Photographic Almanac stated that catechu was a poor toner for platinotypes, but a very good toner for warming up a sepia Japine (11, p. 396). (Perhaps this was Japine paper manufactured by the Platinotype Company).

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[24]In addition, the presence of sulphides in the print may have resulted from improper processing. The use of exhausted fixer could leave silver-thiosulfates in the print and cause staining in all areas; or inadequate washing of the print may leave thiosulfates in the print and cause it to discolor, but only in image areas where the silver was present to react with the sulphur (59, p. 2). Pollutants from the air often contain sulfides which react with the silver in a photograph to give a mirror-like, bluish image. This effect can be used in distinguishing a silver print from other processes.

As mentioned above, Stieglitz was known to have waxed or varnished his platinum prints. Bob Lyons, a private photographic conservator, stated that Stieglitz and Strand often used a #3 Lithograpahic Varnish diluted in carbon tetrachloride to coat their prints (59, p. 1), in order to achieve richer surface effects. With the application of a coating, Stieglitz was also able to obtain greater contrast by producing dark areas unobtainable on uncoated platinum papers (49, p. 53), (8, p. 2). In letters of May 1919 and August 1922, Stieglitz wrote of waxing his prints, and in a letter from July 4, 1927, he specifically asked for beeswax. In a letter from May 5, 1919, however, Stieglitz wrote that varnishing or waxing a print could ruin its quality. In a letter from June 17, 1928, Stieglitz wrote of receiving a solution from Strand, which he poured on the print and then rubbed until dry. Unfortunately this passage was hard to understand, but Stieglitz may have been referring to the lithographic varnish described by Bob Lyons which was capable of penetrating the paper support and causing it to discolor. Benson does not suggest removing coatings from Stieglitz's platinum, palladium, or silver gelatin prints until more research can be done into replacement coatings (8, p. 1, 5).

Although Stieglitz had made enlargements in his early career, after 1917 he was making contact prints, perhaps exclusively, which produced a print inherently closer in tonal values to the negative (and finer in resolution) than any enlargement. A contact print is made by exposing the sensitized paper in direct contact with the negative. Doris Bry stated that during the 1920s, Stieglitz intermittently picked up his old negatives from the 1890s of New York scenes which he had printed as enlargements, and printed them as contact prints on chloride papers (13, p. 12-13).[25]

Stieglitz used fairly simple equipment which was commercially available to the general public. He used a 4 x 5-inch Auto Graflex hand camera, which was a single-lens reflex plate camera (19, p. 137).[26] After 1917 he also used an 8 x 10-inch Eastman View camera with twelve-and thirty-inch lenses and a Packard shutter mentioned in a letter/invoice to Edward Steichen in August 1915. He used a high quality lens, a Goerz Anstigmat

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[25]Bry implies in her note that Stieglitz used chloride papers because platinum paper was no longer available in the 1920s. As mentioned earlier, Stieglitz may still have obtained platinum paper from the Platinotype Company.

[26]The Graflex camera was manufactured by Folmer & Schwing Manufacturing Company, which was bought by Eastman Kodak in 1905. This camera was the most influential design of the 1890s and was considered one of the best of the single-lens reflex cameras available in its time (18, p. 134-7).

13 1/2 inch lens[27] and, according to Doris Bry, "three yellow filters (K-1, K-2, and K-3), three lens hoods, two old tripods, and a white cotton umbrella which he occasionally used as a reflector to lighten shadows in his portraits" (14, p. 19). O'Keeffe also noted Stieglitz's use of the umbrella as a reflector (70, n.p.). For most of his career after 1917, until he renovated the Little House at Lake George in 1927, Stieglitz washed and developed his negatives and prints in a bathtub, and dried them on a clothsline in the kitchen or attic.

In his letters, Stieglitz wrote of using glass plates (gelatin dry plates) until 1922. Beginning with his letters of July 1922, he began to mention using film-packs, sheets of gelatin emulsion on a nitrate-based substrate. Film packs were sheets of film which were cut into various sizes--in Stieglitz's case this would have been 4 x 5 inches in size to fit into his Graflex--which were sandwiched in a small, lightweight, metal container and put in the back of the camera where a plate holder would have been positioned. The sheets were attached in an accordion manner by a tab, which would wind the film when pulled. He noted in letters of July 1922 they were convenient and that he had developed four dozen of them, but that he did not like to use "those shiny little films." It is not clear whether or not he continued to use them. Film packs were commonly used to replace glass plates in hand cameras, but Richard Benson believes Stieglitz may have experimented with them, but did not use them much. Stieglitz probably used a combination of glass plates, cellulose nitrate or cellulose acetate-based films (for gelatin silver prints), and some film packs.[28]

After processing, Stieglitz sometimes spotted his prints, which he wrote about in his letters of October 1920 and September 1922. Beaumont Newhall states that: "He [Stieglitz] was not above retouching some of his prints." Newhall remembers Stieglitz retouching the mast of the boat in the photogravure The Steerage with watercolors. He quotes Stieglitz: "'I never did think that the mast was round enough,' he told me one day as he

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[27]Stieglitz mentions this in a letter of 11/29/1922 from New York to Heinrich Kuehn (34, in Notes).

[28]Michael Hager provided much information on film and cameras used by Stieglitz. He was also very helpful in providing general information.

Hager stated that the glass plates Stieglitz used for lantern slides were for projection only, as typical of the period, and accordingly, only served as positives. (In this process, an original camera negative was transferred to the gelatin glass plate by a contact process.)

sat with brush in hand."[29] Doug Severson stated that O'Keeffe often did Stieglitz's spotting. Some spotting materials which were found advertised in Kodak's The Modern Way in Picture Making 1905, are "Aristo Spotting Colors" or just Indian red watercolor or India ink mixed with water (27, p. 121).

Stieglitz was interested in the mounting of his prints early in his career and often did his own mounting. He was influenced by Emerson, Evans, and Day who first suggested setting off a print for exhibition by properly mounting it (40, p. 89). Stieglitz frequently used rubber cement adhesive, such as Higgin's Photo Mount, often mentioned in Camera Work, to mount his gelatin silver prints to tissue which he would trim and then drymount to a board. In his letter of August 6, 1922, Stieglitz complained about being out of mounting materials, and in a letter from September 2, 1922, he wrote about using Strathmore to mount his prints.[30]

Newhall mentioned that Stieglitz had his prints framed with the mounting tissue passepartout. Passepartout refers to placing a photograph directly against the glass with no frame, using only tape to hold the package together. Newhall stated, "He taught me how to drymount and I often helped him to clean the glass of framed pictures--that is the backside that was in contact with the print! Most conservators are horrified that he had his prints framed with passepartout... he glued the sandwich and the mount." I have not yet encountered anyone who has seen any Stieglitz prints mounted in this way, but it is possible that none framed in this manner still exist.

Some of the problems recently observed on Stieglitz's prints, such as yellow discoloring or pink staining, have prompted some museums to place exhibition restrictions on their photographic collections. This action raises the dilemma of present availability versus long-term preservation of the prints. Doug Severson has had to put exhibition restrictions on their Steichen-treated prints, since the prints have changed measurably over a short period of time when exposed to light. Other institutions, as well, may encounter similar problems with their photographic images, and may also feel necessitated to inact strict restrictions on the exhibition of their prints. If changes which occur during the exhibition of a print are accepted, it still remains a controversial issue of how much change, if any, are we willing to accept.

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[29]From letter of May 14, 1989 to the author. Other conservators I have spoken with differ in opinion with this statement.

[30]In his letters to Charles Sheeler (at the Beinecke Library at Yale University), Stieglitz further discussed mounting issues.

Stieglitz considered each of his prints to be unique images and, as mentioned, would often make ten to twenty, or fifty attempts to arrive at a desired image. In a statement from a catalogue of an exhibition of his photographs at the Anderson Galleries in 1921, Stieglitz stated: "Many of my prints exist in one example only...Every print I make, even from one negative, is a new experience, a new problem. For, unless I am able to vary--add--I am not interested. There is no mechanicalization, but always photography..." (51, p. 217).

One must keep in mind that the fundamental aim of Stieglitz and the Photo-Secessionists was the advancement of pictorial photography, a description which today may be contrary to our image of Stieglitz as a "straight photographer." It is evident in his publications and notes that Stieglitz intentionally manipulated and experimented in the darkroom to achieve each individual image. Conservators should have an understanding of his use of materials and esthetic concerns, and take these possibilities into account during the conservation treatment of Steiglitz's photographs.

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