A PHOTOGRAPHIC OFFSET: THE TECHNICAL STUDY OF ANSEL ADAM'S 1927 PORTFOLIO, *PARMELIAN PRINTS OF THE HIGH SIERRAS*

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ABSTRACT—Gelatin Silver Developed Out (DOP) photographs can offset onto good quality paper folders that have been sized with gelatin-alum sizing. The photographs and paper folders were analyzed using energy dispersive x-ray fluorescence (XRF) spectroscopy. The paper folders were also studied with Fourier Transform Infrared-Attenuated Total Reflectance (FTIR-ATR) spectroscopy.

1. INTRODUCTION

1.1 THE OFFSET

The phenomenon of photographs offsetting onto adjacent papers is well known with platinum photographs, but not with gelatin silver photographs. Offsetting within a photographic context is described when the image of high-density areas in a photograph cause staining to paper in contact with it. A faint image is produced on the paper and is often yellow to brown in color. Popular belief is that the metals within the photograph catalyze the breakdown of poor quality paper initiate the staining. It has been proposed that metals initiate the oxidation of sulfur dioxide to sulfur trioxide and sulfuric acid is created. This technical examination may prove that the sizing in paper and especially the contamination of iron can greatly effect it's potential to offset.

1.2 DESCRIPTION OF THE PORTFOLIO

Ansel Adams, a legendary American photographer (1904-1984) printed his first portfolio of photographs in 1927. The portfolio, *Parmelian Prints of the High Sierras*, was produced by Jean Chambers Moore and was funded by Adam's long time benefactor Albert M. Bender. In 1927 the portfolio sold for $50 a piece.

The portfolio contains 18 signed photographs, each individually housed inside a paper folder. Generally speaking, each folder is titled the same as the title on the photograph with one exception; the photograph titled *Lyell Fork Meadows* is in a folder marked *A Grove of Tamarack Pine*. Becky Senf, Norton Family Assistant Curator at the Center for Creative Photography, mentions in her doctoral dissertation that there was a change in the name of the photograph after printing of the folders and mentioned that a few portfolios may be missing this image due to the apparent mix-up in title. Along with the folders and photographs is a colophon that contains a table of contents. Everything is collected in a black portfolio case and yellow satin interior. Today, the cases are varied in appearance and may have been

changed throughout the run of the portfolio. Unfortunately, the cases are all in poor condition and many are no longer extant with the photographs.

The Grabhorn Press in Oakland, California printed the colophon and folders. Figure 1 is the title page of the colophon. The paper stock for the folders and colophon was handmade by Van Gelder Zonan, a Dutch paper mill. In transmitted light, two Van Gelder Zonan watermarks and laid & chain lines are visible. Figure 2 is an image of the watermarks taken at the Baltimore Museum of Art in August 2008.

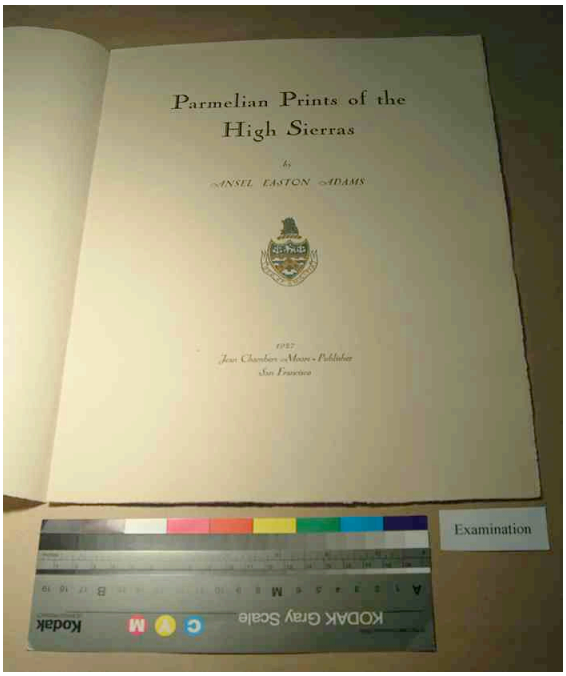

Figure 1


Figure 2

The portfolio contains some of Adam's most well known images including *Monolith, the Face of Half Dome*. The other titles in the portfolio are *Sierra Junipers*, *The Abode of Snow*, *From Glacier Point* or *Glacier Point, On the*

Heights, Mount Galen Clark or *Mt. Clark, Mount Clarence King* or *Mt. King, Roaring River Falls. Marion Lake, El Capitan*, *Banner Peak-Thousand Island Lake*, *Mount Brewer*, *Kearsarge Pinnacles*, *The Sentinel*, *Lower Paradise Valley*, *East Vidette* and *Cloud and Mountain*. The photographs were contact printed on Kodak Athena Vitava Parchment T Thin gelatin silver developed out paper. Both glass plate and film based negatives were used. The T grade was described as a *parchment, white, thin, translucent parchmentized paper* in a 1928 Kodak catalogue. The paper was not manufactured with a baryta layer and was as *Old Master* paper. The paper is translucent in transmitted light, warm in tone and matte in finish.

Mary Street Alinder, Adam's biographer, mentioned that the paper was made for just a short time between 1925 and 1929. The paper was sold in a number of sizes and the exact dimension of the Parmelian photographs, 10" x 12", was an option. Personal communication with Kit Funderburk, Kodak paper historian, confirmed that the paper base was high alpha cellulose made from 100% alpha softwood sulfite pulp from wood pulp and sized with stearic acid. It was the thinnest weight base paper at 14 pounds/ thousand square feet (1927/28) and 15 pounds/ thousand square feet (1929) that Kodak produced during that time.

The exact number of extant portfolios is not known. To this date Becky Senf has located 31 copies. Although the edition was for 150 copies, it is assumed that the edition was never completed. Adams, in his biography, remembers that 150 copies were not produced. A Grabhorn Press ledger corroborates Adam's memory when it states that only 95 sets of folder and colophons were printed for the *High Sierras* project. To further blur the exact number was a 1937 darkroom fire that destroyed a number of portfolios still in Adam's possession. Taking into account that a few of the portfolios were split up and sold separately, the number of extant portfolios may be 75. Andrea G. Stillman (Turnage), Adam's administrative assistant, has mentioned that she thinks the number is closer to 50.

1.3 INITIAL OBSERVATION & SUBEQUENT SURVEY OF PORTFOLIOS

This project began on a summer work project at the Center for Creative Photography, University of Arizona, Tucson, AZ in 2007. During a survey of the collection, the offset was noticed on all three copies of the portfolio. It was flagged for further analysis as the collection was catalogued as being gelatin silver photographs. It was possible that Adams had toned the photographs with platinum, but without instrumental analysis nothing was certain. Figure 3 shows a photograph and the offset from one photograph in Center for Creative Photography's collection of portfolios.

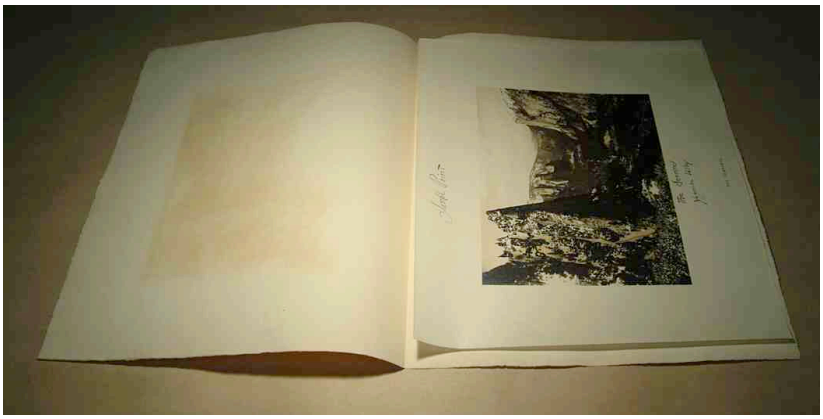

Figure 3

In the following year additional portfolios were surveyed to determine if the offset was prevalent among all collections. During the fall and spring semesters of 2007-2008 six collections were studied and the offset was present in some severity on all of them. It was also noted that the paper folders and colophon were susceptible to staining at folds and not just localized to the photographic offset.

1.4 ANALYSIS

Between June 2008 and July 2009 two portfolios were analyzed using X-ray dispersive techniques in conjunction with vibrational spectroscopy on the photographs and paper folders. Fiber samples were taken at the Baltimore Museum of Art in August 2008.

2. METHODOLOGY

2.1 ENERGY DISPERSIVE X-RAY FLOURESCENCE SPECTROMETRY

The elemental composition of the photographs was studied at two different institutions on two different portfolios. In June 2008, the collection at the Fogg Art Museum at Harvard University, Cambridge, MA was analyzed at the Straus Center. Conservation Scientist Jens Stenger and Paper Conservator Penley Knipe helped with analysis. The photograph titled *Monolith, the Face of Half Dome* was studied using an open structure Rontec ArTax μXRF spectrometer. It was equipped with an electronically cooled x-flush detector that contained a silicon drift detector, high-speed, low noise electronics with a resolution of 160 eV. X-rays were produced with a low power tube and a molybdenum target. The beam was focused by polycapillary optics to a spot size of 70μm x 50μm. All readings were purged by helium which reduced atmospheric components and increased the sensitivity for low weight elements. The paper folder was also studied using the same technique.

Figure 4 shows how the photograph was temporarily matted into a window mat so that it could be safely set-up vertically. The beam was focused on

the low density (Dmin) and the high density (Dmax) of the photograph and allowed to enter and exit the photograph without contact with additional mat board or a table surface. All spectra were collected for 600 counting seconds and an additional reading at 3600 counting seconds was collected on the paper folder. All data was collected a 50kV acceleration voltage and an anode current of 600 μA. The characteristic K_α and K_β lines as well as certain L_α and L_β lines identified the elements.

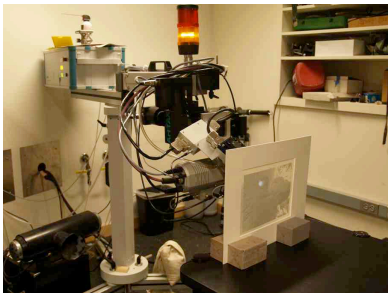
Figure 4

In July 2009, analysis was done on the Lane Collection portfolio at the Museum of Fine Arts, Boston. Readings were taken on two photographs in the portfolio titled *On the Heights* and *Banner Peak*. Additional readings were also taken on four photographs made at the same time as the portfolio photographs, but not included in the portfolio sets. Conservation scientist Richard Newman and Paper Conservator Annette Manick helped with the analysis. The MFA's open structure Bruker AXS 'ArTax' μXRF-X-ray Fluorescence Spectrometer was used. X-rays were produced with a low power tube, 0.65 mm collimator, no filter and a rhodium target.

Figure 5 shows how the photographs were placed on a flat surface and the X-ray analysis done directly over the top of the photograph. This differed from the technique of analysis from the Straus Center. Richard Newman has had good success with analysis done in this orientation. Readings were taken in both the Dmax and Dmin of each photograph and compared. All data was collected at a 40kV acceleration voltage and an anode current of 700 μA for 300 counting seconds.

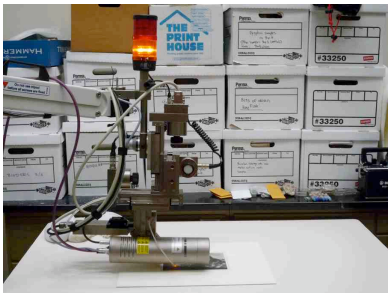

Figure 5

2.2 VIBRATIONAL SPECTROSCOPY

Data on the paper folder was collected at the Straus Center during the June 2008 visit. A Bruker Hyperion 3000 microscope with a attenuated total reflectance (ATR) 100 µm germanium cell. The data was analyzed using a Vertex 20 Fourier Transform Infrared (FTIR) spectrometer. The ATR is non destructive, although does compress the paper fibers in the area of study. No sampling was required. Readings were taken of both the offset and also the background paper. One hundred twenty eight scans were taken and the data was compared to a reference library database. Figure 6 shows how the paper folder was placed directly under the instrument and analyzed non-destructively.

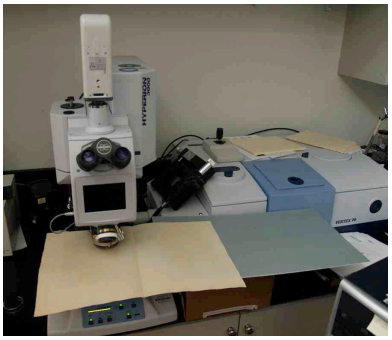

Figure 6

2.3 MICROSCOPY

Fiber samples were collected on the one folder from the Baltimore Museum of Art portfolio. Under a binocular microscope, fibers were teased out of the paper and collected on glass slides. Tom Primeau, Head Paper Conservator helped with sampling. The fiber samples were analyzed using a polarizing microscope with camera attachment. Samples were also stained with Graff's C-stain to determine the alpha cellulose content of the paper fibers.

3. RESULTS

3.1 ANALYSIS OF THE PHOTOGRAPHS

Figures 7 & 8 show representative spectra for the X-ray fluorescence analysis done on the photographs. Figure 8 is of the high-density area from one photograph at the Fogg Art Museum and studied at the Straus Center. Figure 8 is an overlay of Dmin (grey) and Dmax (green) from one photograph at the Museum of Fine Arts, Boston collection. Figure 9 compiles all the information in a table.

Silver was found in all the samples analyzed and assumed to be the major component of the image material. No platinum was found in any samples. Other components identified were iron, calcium and copper all components in the photographic paper. Titanium was also found and is coming from filler used to whiten and brighten the paper.

Selenium was identified in the Fogg Art Museum portfolio. This was unexpected. Although the provenance of this portfolio is patchy, it may have been in Adam's possession when he was actively rewashing, fixing and preserving his photographs in the 1970's. Although no primary evidence was found that links the use of selenium toners on this collection it is known that Adams was actively conserving his own collection. Additional research is needed on this subject, but it is not addressed further in this report because selenium had little to do with the offset. In the future the presence of selenium may become a tool for identifying images in Adam's possession in the 1970's.

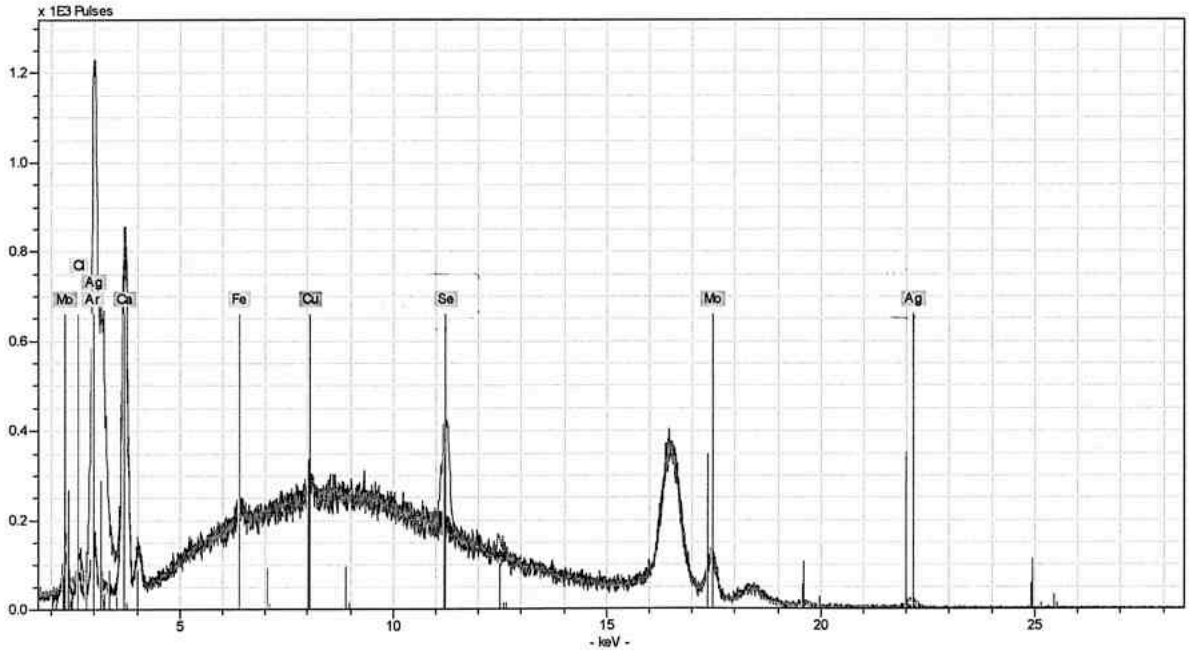

Figure 7

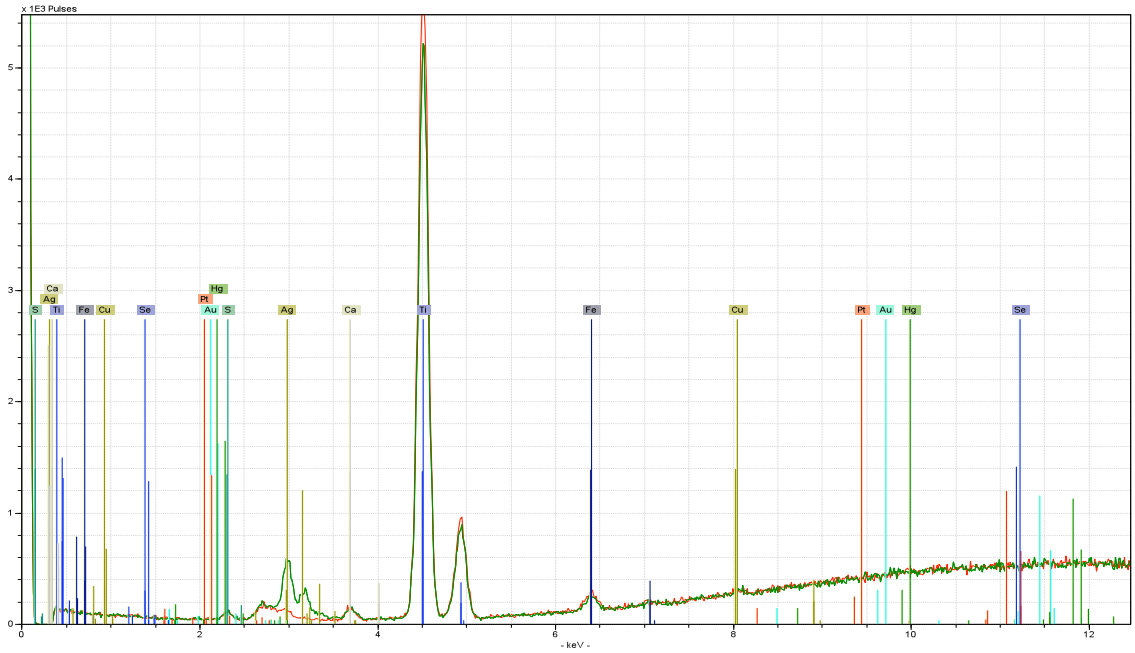

Figure 8

Energy Dispersive X-ray Spectrometry

Title of photograph	**Collection**	**Elements detected**
Monolith, the Face of Half Dome (Dmax)	Fogg Art Museum	Ag, Se, Fe, Ti, Ca, Cu
Monolith, the Face of Half Dome (Dmin)		Fe, Ti, Ca, Cu
On the Heights Dmax	Museum of Fine Arts, Boston	Ag, Fe, Ti, Ca, Cu
On the Heights Dmin		Fe, Ti, Ca, Cu
Banner Peak Dmax		Ag, Fe, Ti, Ca, Cu
Banner Peak Dmin		Fe, Ti, Ca, Cu

Figure 9

3.2 ANALYSIS OF THE PAPER FOLDERS

No differences were detected between the offset and surrounding paper in either the XRF or FTIR techniques. XRF spectra of the paper from the Straus collection collected at both 600-second counts and 3600 second counts are overlaid in Figure 10. There was no difference in the elements detected between the count times except that the peaks were more pronounced after

3600 seconds. Iron was found in great quantity, as the peak is very strong. Copper, calcium, and zinc were identified as well. No silver was detected in the offset and there was little chance of the offset being caused by migration of image material. Aluminum was not detected, although a gelatin-alum sizing in the paper is likely. Aluminum is a light element and is often undetected by the instrument.

Fiber analysis determined that the paper was made of cotton. No wood pulp fiber was identified. Graff "C" Stain colored the fibers a tomato red/ orange. When compared to the Graff "C' Stain Color Chart developed by the Institute of Paper Science and Technology, it resembled a paper made with a high alpha cellulose content. Figures 11 & 12 are images of the sample before and after staining.

The FTIR-ATR data is overlaid with references from the library database in Figure 13. The blue line was the sample. The purple line (cellulose from hemp), green line (alum), red line (rosin) and light blue line (gelatin) were all extracted from the reference library. The similarity in the purple line of hemp cellulose and sample is obvious. There was no sign of a distinct carbonyl group at 1700 cm- in the sample so rosin sizing was ruled out. There were bands at 1300cm- from an amide peaks in the sample and were similar to gelatin in the reference. The presence of alum in the sample were difficult to determine since they fall in the same area at the cellulose peaks, although an amplified peak at 1100cm- in the sample may be from alum. Figure 14 is a compilation of the findings.

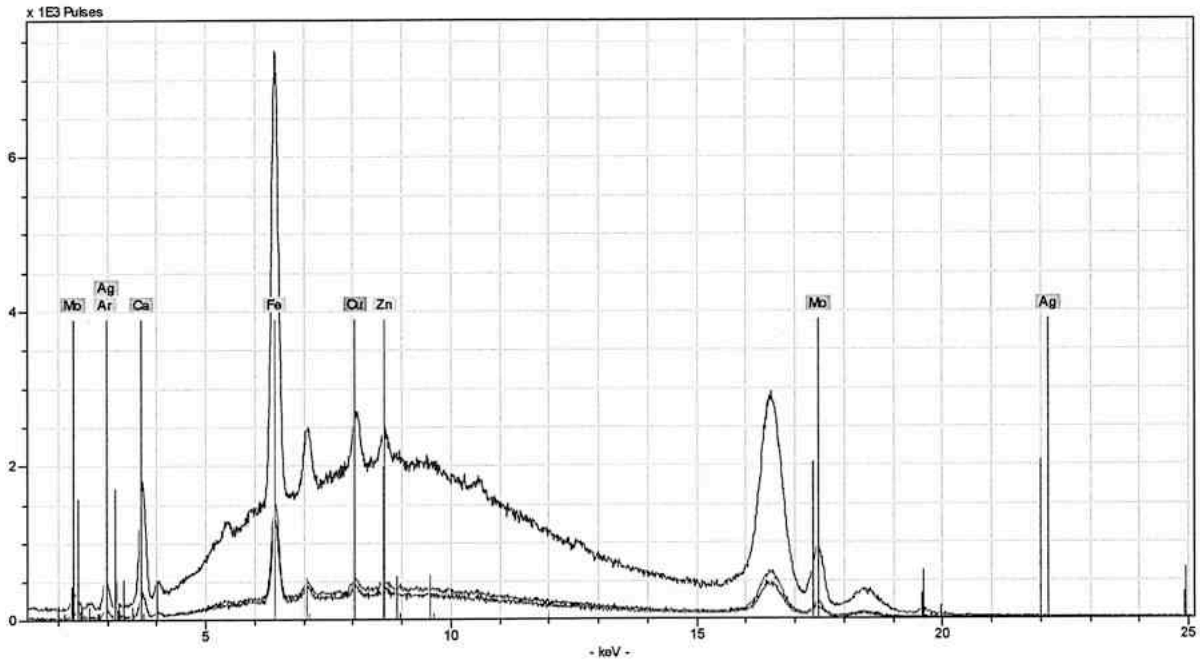

Figure 10

Figure 11: Before staining, approx. 200x magnification

Figure 12: After staining, approx. 200x magnification

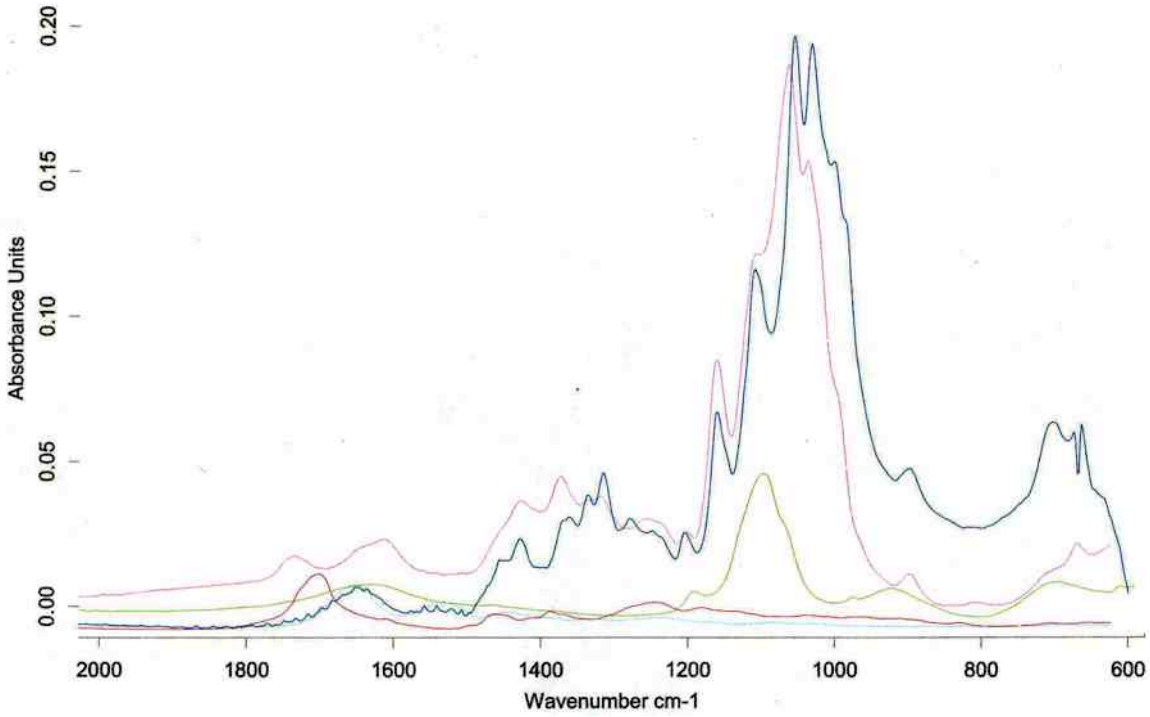

Figure 13

Energy Dispersive X-ray spectrometry & Fourier Transform Infrared Spectroscopy

Paper folder from title of photograph	**Collection**	**Elements detected with XRF**	**FTIR-ATR**
Monolith, the Face of Half Dome	Fogg Art Museum	Fe, Ca, Zn, Cu	Cellulose, protein, alum

Figure 14

4. DISCUSSION & CONCLUSION

This study proved that silver photographs can offset onto good quality cotton fiber paper. It is a misnomer that offsetting on photographs occurs only with platinum photographs in contact with poor quality paper. No platinum was identified in the image layers of any of the photographs analyzed. What appeared to play a large role in the presence of the offset on this collection was the sizing materials used on the paper folders.

A sizing of gelatin and alum were identified on the paper folders. Iron was found in quantity in the paper folders and alludes to the use of a contaminated sizing material. Research done by Irene Brückle in 1993 discussed the role of gelatin-alum sizing in paper. She concluded that contaminations of iron from poor processing of the alum had a higher tendency to discolor paper.

Additional research is still needed to properly understand the mechanisms of offsetting for silver photographs. The next step in the research is to attempt

to re-create the offsetting using silver photographs and gelatin-alum sized papers.

5. ACKNOWLEDGEMENTS

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Lisa M. Duncan is a third year fellow studying photograph conservation at the Winterthur/ University of Delaware program in Art Conservation. She completed internships at the Center for Creative Photography at the University of Arizona in Tucson, AZ; Historic New England in Boston, MA; Heugh-Edmondson Conservation Services, LLC in Kansas City, MO and the Weissman Preservation Center at Harvard University to receive her masters.