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The Effects of Exhibition on Photographs

What happens to photographs when they are exhibited in gallery conditions? This subject has produced much speculation and some laboratory testing, but very little actual measurement of change in real exhibition situations.

The photography collection at the Art Institute of Chicago has a very active exhibition program. Frequent decisions must be made about whether a certain photograph can safely be exhibited, either in the museum's own galleries or on loan to another institution. In an effort to base these decisions on real data rather than speculation, a program was begun to monitor changes in prints by making reflection density readings before and after exhibition.

The monitoring method used was described in an article in the fall 1981 issue of the Journal of the AIC called "Monitoring the Fading and Staining of Color Photographic Prints" by Henry Wilhelm. This article provided detailed working instructions which shall not be duplicated here. The method shall instead be briefly outlined to provide a basis for understanding the actual results presented.

To monitor a given print, an overlay was prepared using 3-mil polyester with one side matte. The slightly oversize sheet was placed over the print with the matte side up, and the edges and a few details of the image were sketched in to ensure that the overlay could be returned to exactly the same position on the print. Six to twelve areas on the photograph were chosen to be read, including high, middle, and low densities, and any suspect areas such as a stain. These locations were marked on the overlay, then the sheet was removed and

turned over. A hole was punched at each marking with a #6 leather punch. (The sheet was inverted for punching so the edges of the hole would lift away from the print rather than toward it, to prevent scratching.)

Reflection density readings were then made using a MacBeth TR524 Densitometer with Wratten filters. The instrument was regularly calibrated with the MacBeth porcelain check plaque and a set of color photographic calibration standards, all of which were kept in humidity-controlled cold storage when not in use. All readings were made with the same instrument and the same filters in the same location. Two different operators were used, but frequent cross-checks were made to verify readings and no discrepancies were found. Reliability of the readings was estimated quite conservatively, with a margin of error of ±.02 — thus, only changes greater than .04 were considered significant.

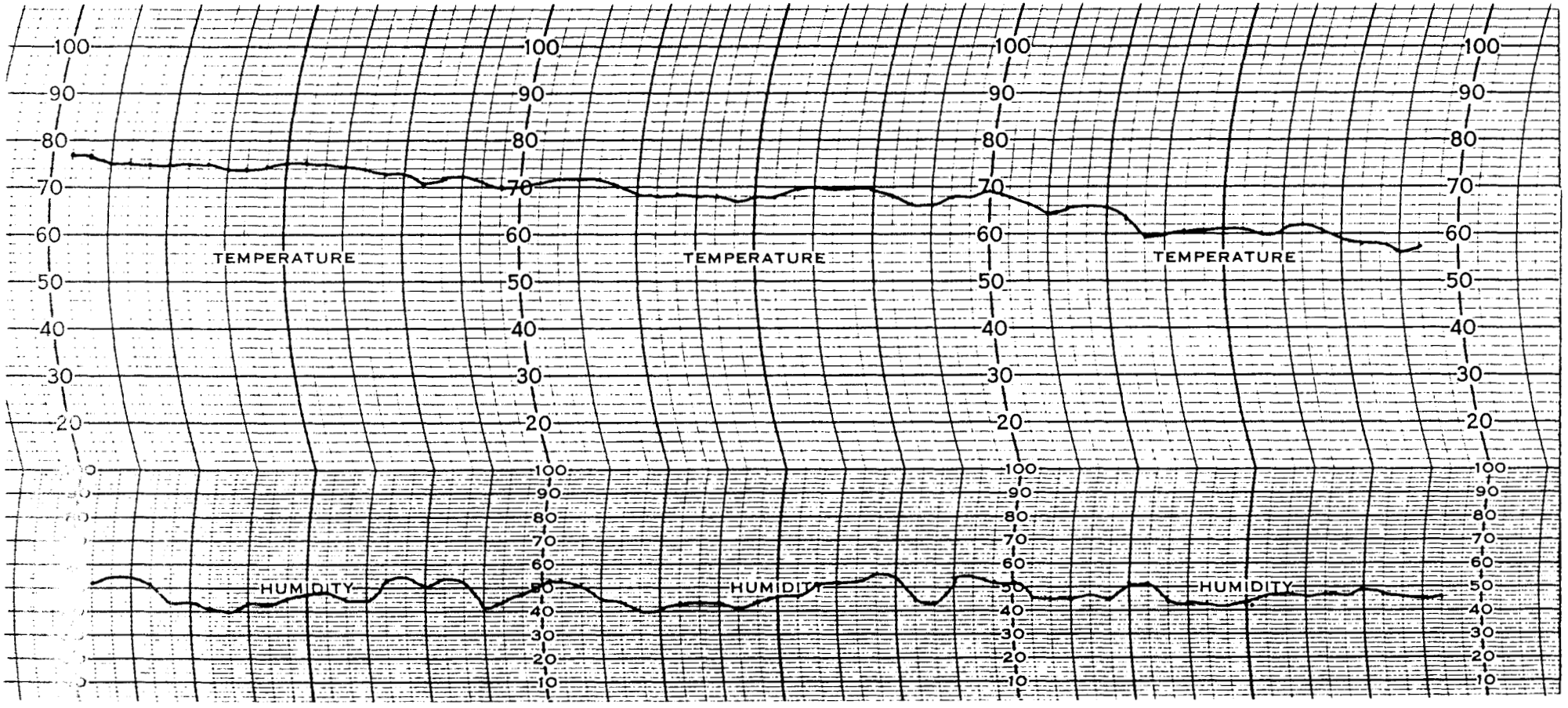
For simplicity and brevity, the results presented here constitute a case study of one particular exhibition. This show included 180 photographs from the Art Institute Photography Collection, representing a broad cross-section of photographic history and technique, with prints dating from 1842 to 1982. Thirty eight of these prints, including 13 different processes and 24 different artists, were monitored before leaving Chicago and again after their return.

The prints were away from the Art Institute for a total of 12 weeks, with the actual exhibition lasting for 9 weeks. During that period the gallery temperature ranged from 56-77°F and relative humidity ranged from 39-66% (see Figure 1). The gallery lighting was all tungsten (no daylight or fluorescent), with levels specified only as "less than 30 footcandles". Information about air quality in the gallery could not be obtained. The photographs were all transported and exhibited in ragboard mats and in frames containing Acrylite OP-2 ultraviolet-filtering acrylic sheeting.

While not ideal, these exhibition conditions are not atypical of what most museums and galleries actually achieve (as opposed to what is striven for or promised). In fact, these conditions may be somewhat better than average, since the largest deviation from normal requirements is in the direction of lower temperature, which is generally beneficial to photographs.

There are, however, two unknown environmental factors which may have contributed heavily to the changes that

FIGURE 1



COMPRESSED HYGROTHERMOGRAPH CHART FOR 9-WEEK EXHIBITION PERIOD

(each vertical line represents 1 day)

took place in some of the prints. First, the air quality may have been poor. While no measurements of pollution levels were available for this particular time and place, the damaging effect on photographs of various common oxidants in the atmosphere is well-known.

Secondly, the photographs may have been exposed to excessive or rapidly fluctuating temperatures and humidities in transit. It has been shown that the baggage compartment of an airplane can be as cold as -40° F, while that of a truck on a hot day can reach as high as 120°F. Uncontrolled humidity can be even more damaging, and it is known that the crates in this exhibit experienced at least one major rainfall in the course of their journey. Conditions in transit are always one of the most difficult aspects of any traveling exhibition to control and measure, but they may be a more likely cause of damage than any other event in the full course of the exhibit.

The actual changes found in the 38 photographs monitored for this exhibition are presented in Table 1. Changes are reported as percentage of initial density in whichever color changed most — generally blue. While this does not fully describe the changes in a print, it does provide a simple but meaningful index of relative amounts of change.

In order to determine if the changes found were indeed related to exhibition and would not also have occurred in storage, another set of density readings were made on all prints after an equivalent 12 weeks in dark storage in the Art Institute's temperature and humidity-controlled vaults. No further changes from the previous readings were found.

The figures presented in Table 1 are somewhat erratic and clear patterns are difficult to discern. However, several results are quite notable, and certain tentative conclusions can be drawn pending further investigation.

Overall, of the 38 prints monitored, 17 did not change, 15 changed 10% or less, and 6 changed more than 10%. Of the 13 different processes monitored, only 5 were immune to change and 4 of these were rather unusual or hybrid materials (silver gelatin being the only common process to remain unchanged).

With regard to albumen prints, the most common type of nineteenth century photographic material, several points can be noted. Support can be found here for the notion that the rate of image deterioration in these materials is closely related to their condition. Without exception, the prints in better condition showed more

TABLE 1

	ARTIST	DATE	PROCESS	ORIGINAL CONDITION	% DENSITY CHANGE IN SHADOWS	MIDTONES	HIGHLIGHTS
1)	Fox Talbot	1842	calotype negative	fair	0	0	0
2)	Salzman	1854	salted paper print	good	0	+6%	0
3)	Cameron	1857	albumen print	fair	0	0	0
4)	Cameron	1874	albumen print	good	+5%	0	0
5)	Cameron	1867	albumen print	good	+7%	+15%	+30%
6)	Frith	1857	albumen print	good	+7%	+10%	+12%
7)	Baldus	1855	albumen print	fair	0	0	0
8)	LeGray	1856	albumen print	fair	0	0	0
9)	MacPherson	1867	albumen print	fair	0	0	0
10)	Bourne	1865	albumen print	good	+5%	0	0
11)	Bisson Frères	1863	albumen print	good	+5%	0	0
12)	Atget	ND	albumen print	good	+5%	0	0
13)	Watkins	c.1865	albumen print	excellent	+5%	0	0
14)	Jackson	1892	albumen print	excellent	+5%	+15%	+38%
15)	O'Sullivan	1863	albumen print	good	0	-10%*	0
16)	Fenton	1856	dilute albumen	fair	0	0	0
17)	Tripe	1858	dilute albumen	fair	0	0	0
18)	Atget	c.1910	matte-albumen	good	0	-14%*	0
19)	Atget	c.1910	gelatin p.o.p.	good	-5%	-10%*	-10%*
20)	Steichen	1904	multiple gum print	good	0	0	0
21)	Stieglitz	1919	palladium print	good	+15%	+30%	0
22)	Stieglitz	1931	silver gelatin	good	0	0	0
23)	Strand	1928	silver gelatin	good	0	0	0
24)	Hine	1909	silver gelatin	fair	0	0	0
25)	Hine	1920	silver gelatin	fair	0	0	0
26)	Meyerowitz	1978	Ektacolor 74 RC	excellent	0	0	0
27)	Meyerowitz	1978	Ektacolor 74 RC	excellent	0	+10%	0
28)	Meyerowitz	1978	Ektacolor 74 RC	excellent	-3%	+5%	0
29)	Pfahl	1981	Ektacolor 74 RC	excellent	-5%	0	0
30)	Pfahl	1980	Ektacolor 74 RC	excellent	0	+5%	0
31)	Porter	1951	dye transfer	good	0	0	0
32)	Porter	1963	dye transfer	good	0	0	0
33)	Porter	1967	dye transfer	excellent	-3%	0	0
34)	Porter	1969	dye transfer	excellent	-6%	0	0
35)	Porter	1974	dye transfer	excellent	0	-20%	0
36)	Gioli	1982	Polacolor 2	excellent	0	0	0
37)	Gioli	1982	Polacolor 2	excellent	+3%,-8%	0	0
38)	Josephson	1969	color litho, etc.	good	0	0	0

* measured at edge of image

density change than those in poor condition. For instance, the most stained and faded albumen print in the exhibit, (#7 by Baldus) was unchanged, while that with the richest tonalities (#14 by Jackson) stained considerably. Also, the pattern of results in prints #10-13 would indicate that staining appears first in the shadows, where it is the least detectable by the human eye.

Perhaps the most surprising result to be found here is the change that occurred in photograph #21 by Stieglitz. Platinum and palladium prints have a reputation for extreme stability, but this image yellowed considerably in the midtones and shadows. One might assume the change is a yellowing of the paper base due to the acidic nature of the process, but the absence of highlight yellowing tends to contradict that notion. There may be other deterioration mechanisms at work here.

The color photographs, on the other hand, may have changed less than one would anticipate, given their reputation for instability. One might also note the inverse relationship of age to deterioration with the five Eliot Porter dye transfer prints — the newest print changed most while the oldest was stable.

Patterns such as those mentioned above are of interest but must await confirmation by other measurements. One must also consider that density change is just one aspect of the deterioration that photographs undergo. No attempt was made with these prints to measure the sorts of physical change that may also have occurred (e.g. surface cracking or embrittlement).

However, one principal conclusion seems inescapable — namely, that some photographs do indeed change when exhibited, sometimes in ways that are difficult to understand or predict, and sometimes more than one would ever anticipate.

The question of how much, if any, change should be deemed acceptable is a large and controversial topic which shall not be addressed here. Suffice it to say that according to the "Recommended Limits of [Color] Print Image Deterioration" stated in the aforementioned Wilhelm article, 21 of these 38 monitored prints would have exceeded those limits in this one exhibition period.

This method of print monitoring can be a very time-consuming and exacting activity. But for those in a position to make decisions or give advice about exhibiting photographs, the information it provides can be extremely useful and important.