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DISPLAY OF ALFRED STIEGLITZ AND EDWARD STEICHEN AUTOCHROME PLATES: ANOXIC SEALED PACKAGE AND LIGHTING CONDITIONS

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ABSTRACT - Research carried out at The Metropolitan Museum of Art determined the benefits of using low-oxygen conditions for the display of autochromes, when compared to exposure under normal ambient oxygen levels. This work is presented in this volume in the article *Behavior of Autochrome Color Screen Dyes Under Anoxic Conditions* (Casella 2011). The results of this research allowed the Met to exhibit original autochrome plates for the first time in over twenty-five years as part of an exhibition entitled *Stieglitz, Steichen, Strand*. Five autochromes by Alfred Stieglitz and Edward Steichen were displayed in nearly anoxic conditions (0.1% oxygen) for one week in January 2011. Facsimiles were displayed for the remainder of the exhibition.
The following paper highlights the design of an effective low-oxygen sealed package and how it was practically assembled; the light sources used for display; monitoring methodology before, during and after exhibition; and the method employed for facsimile display.

1. INTRODUCTION

The Department of Photographs at The Metropolitan Museum of Art includes in its collection an important group of forty-five autochromes by Pictorialist artists, with iconic images such as Steichen's portrait of Alfred Stieglitz holding a copy of *Camera Work*, or the portrait of Rodin with his sculpture, *The Eve*. Introduced in 1907, autochromes were the first commercially viable color photographic process. Pictorialist photographers were excited by its introduction and used it enthusiastically. However, after 1910, examples of autochromes by these artists are rare, which makes this small collection of photographs from this brief period particularly special.

Previous research on the autochrome process, in particular, the accelerated aging tests carried out by Bertrand Lavédrine (Lavédrine et al. 1993), have made evident the extreme fragility of the dyes present on the autochrome color screen when exposed to light. As a result, the majority of cultural institutions holding autochromes in their collections - including the Met - have established a policy of withholding originals from display, using facsimiles instead (Wagner et al. 2001).

The physical structure of the autochrome is laminar, starting with a glass support, then a first layer of varnish that remains sticky for the application of a layer of potato starch grains dyed red-orange, green, and blue-violet, with carbon black powder to fill the gaps between the grains; a second varnish layer to protect the starch grains from moisture; and a photo-sensitive black and white silver gelatin emulsion. The manufactured plate was then exposed and processed by the photographer, who commonly added a final protective varnish coating. It is the color screen layer that is the most sensitive to light exposure, and the principal object of this research.

2. LIGHT-FADING EXPERIMENT

Low-oxygen and anoxic environments have long been known to protect certain colorants from light-damage (Arney et al. 1979). Recently there has been a particular focus on the application of anoxia for the exhibition of artworks (Beltran et al. 2008; Townsend et al. 2008).

Experimental research was carried out at the Met, with the supervision of Nora Kennedy and the great support of research scientist Masahiko Tsukada, to determine the effect of anoxia on the light-fastness of the dyes present in the autochrome color screen.

A first experimental phase focused on the six individual dyes comprising the autochrome color screen (Casella 2009) – Erythrosine B, Tartrazine, Rose Bengal, Setoglaucine, Patent Blue and Crystal Violet.

A second experimental phase tested the red-orange, green and blue-violet colorants that result from mixtures of the six individual dyes (Casella 2011). Dye samples prepared following historical formulations, as well as historical study collection autochrome plates, underwent light aging both at environmental oxygen levels and close to anoxic conditions (0.1% oxygen).

The results of the two experiments showed a significant decrease in fading of all the samples under low-oxygen conditions. See article *Behavior of Autochrome Color Screen Dyes Under Anoxic Conditions* in this volume for results on the first experimental phase. The full results of the second experiment will be published in ICOM-CC's 16th Triennial Conference Preprints.

3. EXHIBITION

Five autochromes by Alfred Stieglitz and Edward Steichen were displayed as part of a group of 119 photographs in the exhibition *Stieglitz, Steichen, Strand*. Facsimiles were exhibited for the majority of the show's duration, but with the success of the anoxic light fading tests, the decision was made to display the original plates for seven days during the exhibition – a period of time that falls well within the parameters established as safe by the recent research.

Preparing the original autochromes for display involved creating their low-oxygen packages, carrying out color monitoring of the original plates, and quantifying the light exposure during exhibition.

3.1. Low-oxygen Packages

For the original autochromes, a sealed package was needed that would allow exhibition for a short period of time under low oxygen conditions. A primary goal was to develop a straightforward, economically viable and practical system.

The design was modeled on what has been used at Tate Britain for works of art on paper. The package has two acrylic sheets and an acrylic spacer, which must be the same thickness or slightly thicker than the matted object. Although acrylic is permeable to oxygen in the long term, for short-term use it provides a sufficient barrier. Mitsubishi RP-K™ scavengers were used to absorb any residual oxygen along with Mitsubishi Ageless Eye™ oxygen indicators, which detect levels above 0.1%. A butyl rubber tape was used as the gasket material, which also acted as a sealant that held the package together.

Each autochrome was fitted into a sink mat to hold it in place, leaving a cavity for the scavengers and indicator. Using a glove bag purged with Argon at 45% RH, each matted autochrome was sealed in its package in an environment with oxygen levels below 300ppm. Once assembled, the edges of the packages were clamped for 24 hours to ensure a reliable seal.

These sealed packages were then framed behind a window mat and an additional glazing layer. Since each autochrome was to be displayed behind not one, but two layers of glazing, the decision was made to use non-reflective acrylic for the face of the sealed package and the additional layer. A prototype was assembled using non-reflective acrylic ahead of time to be certain that the butyl rubber would adhere properly to the non-reflective coating on the acrylic.

3.2. Light Sources

Ideally, light sources for autochrome display - as with most works of art - should emit no UV radiation, no heat, and should have a neutral color temperature.

Several light sources were investigated for the display, including LEC panels (Light Emitting Capacitors), which were not bright enough for rendering the details of an autochrome. OLEDs (Organic Light Emitting Diodes) were also considered, but were not available in North America at the time of our research.

The LED "Lite Pad" manufactured by Rosco International was ultimately chosen for use in the exhibition. It is one-quarter inch thick with LED's (Light Emitting Diodes) around the perimeter and a grid of channels etched into acrylic sheeting to distribute the light evenly. It provides an almost neutral white light, it can be easily outfitted with a dimmer in order to set specific light levels, and it can be ordered in custom sizes.

The Lite Pad has two drawbacks. First, it generates some heat on the surface. Second, even with the dimmer set to its lowest setting, the Lite Pad emits about 500 lux. A simple solution to both problems is to position the Lite Pad at some distance from the artwork to allow for both ventilation and lower light levels.

3.3. Installation

The original works and facsimiles were displayed on a wall with a small interior cavity. A hole was cut in the wall and the framed autochrome hung in front of it. A Lite Pad was mounted behind each work of art inside the wall, on the opposite side of the interior cavity, providing a distance of about twenty-four inches from each autochrome.

For the facsimiles, the Lite Pads remained illuminated constantly while the galleries were open. The only addition to the set-up was a diffusing layer of white vellum paper behind the facsimile, which disguised the grid pattern and edges of the Lite Pad.

For the original plates, the diffusing layer stayed in place and a button was installed in the wall and attached to the Lite Pad, allowing viewer-activated lighting. The light stayed on only while the button was pressed.

4. LIGHT MONITORING

In order to track light exposure, a Hobo U12 datalogger was installed on the inside of the wall beside one of the autochromes – Steichen's *Rodin – The Eve* – facing the light source. The following results reflect the conditions for this particular autochrome, but generally represent the group.

Set to record once per second, the datalogger recorded the level of incident light on the back surface of the wall on which the autochromes were mounted. This light level was higher than the actual light level transmitted through the autochromes. As a result, this data reflects the number of times the button was pushed and the duration, but not the actual light levels on the plate, which were measured through the diffusing layer with a Minolta T-10 Illuminance Meter. In general, the diffusion layer reduced the light level by about 40%.

4.1. Light Monitoring Data

The original autochromes were displayed for seven days. The resulting graphs from the datalogger showed a series of peaks with each peak representing an instance that the button was pressed; the width of each peak indicated the duration of each viewing. With this data, the light dosage for each autochrome was calculated.

Implementation of viewer-activated lighting significantly reduced the overall light exposure. Gallery lights were kept on for a total of 77 hours over the course of the seven days that the plates were displayed. According to the recorded data, the button activating the Light Pad was pressed for just under seven and a half hours. Combined with continuous gallery lighting at 25 lux, the total dosage for the exhibition period was 3,753 lux hours.

5. COLOR MONITORING

Color measurements were taken with a Barbieri Spectro LFP transmission spectrophotometer borrowed from Barbieri Electric. The readings were taken without contact with the plate using standard illuminant D65 and an aperture of 2mm. Five measurements were taken at each measurement site and averaged. On each plate there were between three and five measurement sites.

The overall density of autochromes and the heterogeneous nature of the color screen make obtaining reliable color readings on autochromes difficult on a macroscopic scale. Based on the recent anoxic research, no significant change was predicted. However, if change were to occur, it was expected to appear as fading of the blue starch grains, translated as an increased b* value in the CIE L*a*b* color space.

Despite isolated readings that showed statistically significant change, overall, the results of the color monitoring suggest little or no change to the plates. There was a lack of consistency of results from multiple reading sites on the same plate. The disparity among these results illustrates the difficulty of recording color on these objects.

6. CONCLUSIONS

The *Stieglitz, Steichen, Strand* exhibition was a resounding success, with almost 7,000 visitors attending the show during the week in which the original autochromes were displayed. The publicity this exhibition drew served to focus attention on these unique objects, making it possible to imagine future exhibitions of autochromes for limited amounts of time and providing to the public the irreplaceable experience of viewing originals.

Since the sensitivity of autochromes to light is far too great under normal environmental conditions, it is only the application of anoxic and low oxygen conditions that will make this possible, promising an effective solution to the problem of light-damage during exhibition.

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