

## An Investigation of Some Screen-Prints By Corita Kent

### ABSTRACT

Harvard Art Museums hold a collection of 79 screen-prints by Corita Kent published between 1964 and 1969. It is intended that nearly all of these prints will be included in the travelling group exhibition *Corita Kent & the Language of Pop*, scheduled for Fall 2015. A number of the Corita prints in the collection include daylight fluorescent inks not commonly used by fine art printmakers of the period. Many of the earlier works are also printed on Pellon, a material unusual to printmaking.

The purpose of this research was to further the understanding of Corita's approach to printmaking and to investigate the light sensitivity of the daylight fluorescent inks in order to inform the exposure parameters for the collection. While it was found that there are some complicating factors in using the micro-fading tester to investigate daylight fluorescent inks, the results suggest that they are possibly more stable than previously thought.

The constituents of Pellon were analyzed to better understand its long-term stability and conservation treatment tests were carried out on three screen-prints on Pellon; the treatments are outlined and the results discussed.

### INTRODUCTION

The prints in Harvard Art Museum's collection, which can be loosely divided into two groups, span an important period in Corita Kent's life and artistic career. Corita printed those produced between 1964 and mid-way through 1967 in the art department of the Immaculate Heart College, the progressive Catholic community in Los Angeles where Corita trained and had spent the majority of her adult life. She often used the three-week summer vacation from teaching to edition her prints, either in the basement of the college or in a one-room workshop across the street. Colleagues, friends and students were usually persuaded to help.

---

Presented at the Book and Paper Group Session, AIC's 42nd Annual Meeting, May 27–31, 2014, San Francisco, California.

The images in these early prints were created using hand-cut paper stencils with the occasional additional use of stop-out applied to the screen by hand. The printing is characterized by occasional poor registration of the color separations and other inconsistencies between sheets. Off-set ink occurs on the verso of some prints and odd strips of color are present in the margins, possibly a result of ink that 'escaped' beyond the stencil. It is speculated that quickly producing large numbers of prints, in cramped conditions with volunteer assistants, could explain variations in the prints within an edition.

The prints in the first group are printed almost exclusively on Pellon, a stiffening and interfacing product used in clothing and quilting. Mary Anne Karia, the artist's assistant at this time, suggests it is possible that Corita used Pellon because she thought it could be cleaned (Karia 2013). Corita described her use of the material in an interview:

*Corita:* Yes, these are on Pellon, which is a 3M product. It's actually cloth material, used for clothes lining, like men's coats, in tailoring.

*Galm:* Now was this something that you discovered, or were other printers using it for production?

*Corita:* I don't know that anybody else used it. They were using rice paper and similar papers, but this seemed so very practical and was much cheaper than the rice paper and much stronger.

*Galm:* Did it give your serigraphs a different quality?

*Corita:* The paint does look different on them. When you take a slicker surface or a harder surface, the paint has a more brittle quality—a brighter, sharper quality, whereas these, no matter how sharp the line is, the paint has a soft look. So there is that difference. (Oral History Program UCLA 1977)

The second group of prints, produced from 1967 to 1969, were printed by Harry Hambly in his commercial screen-print workshop in Santa Clara, California. Corita left the Immaculate Heart in 1968. She was given a dispensation from her vows and moved to Boston to pursue her artistic activities full-time. She sent instructions, working sketches



Fig. 1. *Where There's Life There's Mud* 1966 Harvard Art Museums 2008.153 Detail, field of view 20mm.

and color swatches to Hambly and discussed details over the phone. Examples of the correspondence between the two provide valuable insight into Corita's working methods (Corita Papers 1936-1992 MC583, Schlesinger Library, Harvard University). This arrangement had been in place for two years before Corita even met Hambly in person. It proved a successful and productive relationship and Hambly continued to produce Corita's prints for the rest of her life.

"I usually do my work about three inches square, sometimes—and say, "Enlarge this to such and such a size, and do this in this color, and this is this color." And he always either understands or knows enough to ask questions. So that actually now it's come down to my doing the design for them—he does the printing." (Oral History Program UCLA 1977)

This group of prints is all on off-white wove paper. Text is still a central feature of the images but photographic elements, printed on half-tone screens, are introduced. The registration of the color separations is accurate, there is an

increased complexity and detail in the images and the printing is more technically advanced.

Corita was extremely prolific. Besides teaching and writing she published some 257 editions between 1964 and 1969, the period covered by the Museum's collection. She maintained a catalogue of her prints and while edition sizes are not always recorded, it suggests that she produced approximately 18,000 sheets during this period. Although the prints were published in signed and limited editions, they are not numbered and dated in the usual way. Corita used a two-part numbering system that reflected the year the print was published and its position in an alphabetical list of titles published that year. Individual prints in the edition were not marked with the edition size or the specific number of that sheet within the edition.

#### DAYLIGHT FLUORESCENT INKS

Thirty-seven of the 79 prints in the Harvard collection include the use of one or more daylight fluorescent inks; these inks feature throughout Corita's printmaking of the late 1960s, spanning both her work at the Immaculate Heart and her collaboration with Hambly. These colors appear on both the paper and Pellon supports. Two daylight fluorescent inks sometimes overlap on one print, but all the prints in the collection also include separations printed in standard, non-fluorescent colors.

Daylight fluorescent pigments derive their characteristic luminous appearance from the combination of two effects—directly reflected light and fluorescent emission, where a material absorbs electromagnetic radiation of a particular wavelength and emits radiation at another, longer wavelength. As a result, these inks appear, and can be measured, to reflect more than the 100% total available incidental light.

While the second half of the twentieth century saw significant advances made to both light-fastness of these pigments and in the reduction of the pigment particle size (a fine particle size enabled the use of these colorants in letterpress, gravure and lithographic printing; they had previously only been suitable for screen-print processes), these colorants are still generally accepted to be highly fugitive and susceptible to fading (Connors-Rowe et al. 2005).

There are a limited number of organic fluorescent dyes suitable for use in the manufacture of daylight fluorescent pigments. The combination of two or more dyes is a common occurrence that enables both a wider variety of hues than would otherwise be available and allows the manufacturer to take advantage of energy transfer between the different fluorophors. This occurs when the emission profile of the UV fluorescent dye overlaps the excitation profile of the second, resulting in a higher degree of fluorescence than could be achieved by the second dye alone. Complex and unpredictable fading patterns may occur if the fading of individual dyes

disrupts the energy transfer. Research has shown that current formulations of these pigments are heavily dependent on dyes that are ultra-violet fluorescent, included to facilitate energy transfer (Hinde et al. 2013). As a result, the common conservation strategy of limiting UV in display environments may potentially affect the appearance of these colors.

Daylight fluorescent colors present a variety of challenges to the conservator—not the least of which includes accurate documentation. Accurately color-matched images are a standard approach to monitoring change resulting from light exposure, but fluorescence cannot easily be recorded or replicated using traditional photographic imaging. It requires a light source with an output sufficiently broad to trigger fluorescence in all the dyes present, including those with an excitation profile in the ultra violet region. The brightness of the reflected light is orders of magnitude stronger than that of fluorescent emission (Hinde et al. 2007), and as a result it ‘masks’ the fluorescence when recorded photographically, resulting in an image with altered hue and lack of luminosity. Noting the lighting environment used when photographically documenting these objects may prove useful for conservators wishing to replicate the conditions for future comparison.

#### MICRO-FADING TESTS

The micro-fading tester has become a generally accepted tool for examining the fugitivity of works of art and other museum objects; the design and use have been extensively outlined (Whitmore et al. 1999). Tests were carried out on three prints, two on Pellon and one on paper. Each print included both daylight fluorescent and standard colors; each color on each print was tested, including areas where two inks overlapped. Tests were also run on the non-printed supports. Micro-fading was carried out three times in each location and photo-micrographs were taken before and after testing, which showed no discernable color change at the test spots.  $\Delta E$  (1976) was calculated for each test and compared to those of Blue Wool Standards 1, 2 & 3; these standards were run before and after each test batch for calibration.

All non-fluorescent inks on the three prints were found to fade with a pattern similar to that of blue wool 3, i.e.  $\Delta E \leq 1$  after five minutes, with one ink in two prints proving slightly more sensitive. No significant differences were noted where inks overlapped. The non-printed Pellon support brightened very slightly. All the fluorescent inks tested displayed significantly different fading curves to those of the non-fluorescents, with a sharp color change ( $\Delta E \approx 2.5$ ) occurring in the first 30 seconds (fig. 2).

It was clearly important to try to investigate this initial change as it accounted for the majority of the fading that occurred over the test as a whole. Tests were run on the fluorescent inks where the lamp was alternately switched on and off for one minute periods. The result was unexpected as it

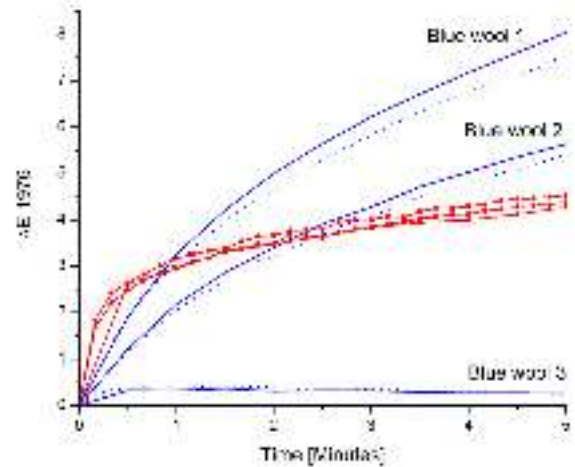


Fig. 2. Micro-fading data for daylight fluorescent ink in *Questions and Answers* 1966 Harvard Art Museums TL41188.

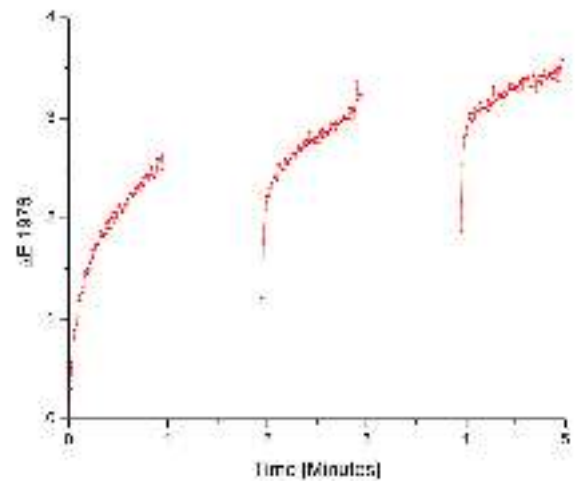


Fig. 3. On/off micro-fading data for daylight fluorescent ink in *Questions and Answers* 1966 Harvard Art Museums TL41188.

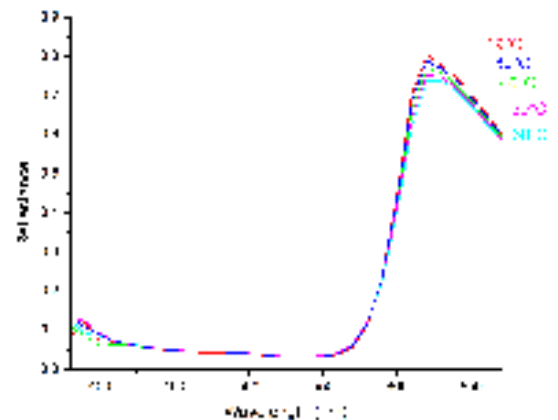


Fig. 4. The effect of temperature on the reflectance spectra of Kremer Flame Red sample.

shows that much of the initial color change reverted and, while fading does occur, the initial test result is likely to be an overestimation (fig. 3).

The surface temperature of the sample at the test location of the micro-fader has been investigated and the maximum found to be between 44°C–52°C (Whitmore et al. 1999). Further tests were undertaken by the author to explore the possible link between the increase in temperature of a sample, due to the micro-fader light source, and the reflectance. Samples were prepared using a variety of daylight fluorescent colorants in the current Kremer Pigment range in an acrylic binder and the paints were applied to pieces of aluminum to ensure even distribution of heat during the testing. The samples were heated using a module with an integrated thermometer; the temperature of the surface of the sample was also taken with a non-contact laser thermometer. The reflectance of each sample was recorded with a colorimeter.

The results showed that there was a clear link between the reflectance of the daylight fluorescent pigments and the temperature of the sample. All four pigments tested showed a reduction in their primary reflectance peak as the temperature was increased. Significantly, it recovered on cooling. The sample of Magenta Red also showed a slight positive shift after the sample was cooled in a freezer. These tests suggest that the initial fast color change observed during micro-fading should be discounted. It is a temporary phenomenon caused by the increase in the temperature of the sample due to the light source (fig. 4).

All the inks tested on the three Corita screen-prints have a light-fastness at least equivalent those of between the blue wool standards 2 and 3. Under the current Harvard Museums lighting guidelines, this would allow between 16 to 32 6-month rotations at 50lux before a ‘Just Noticeable Fade’ (JNF), defined as Grey Scale 4, the first noticeable step of fading used in most light-fastness tests (CIE Technical Report 157:2004).

It is important to note that the range that includes blue wool 2 and 3 is large and there is significant uncertainty when ascribing dose to JNF ranging approximately to the value of the adjacent blue wool (Michalski 2013). These categories have been described as high or medium-high sensitivity groups (Tse et al. 2011). Caution should be used when calculating display parameters for these prints. Micro-fading has only been conducted on three prints and conservation research into the long-term behavior of daylight fluorescents is limited.

#### PELLON

A variety of inconsistencies in the surface of the Pellon were noted during a survey of the prints in the Harvard collection. ‘Clumps’ of fibers on the surface of the sheet and series of ‘ripples’ were observed which resulted in subsequent uneven inking in the printed image. It also appears that when heavily inked, the support can ‘saturate’, with ink visible on the

verso. The display history of these prints is not known, but a number of the Pellon sheets have discolored to a slight pale yellow color. Though not widespread, there are also instances of more distinct uneven brown orange discoloration.

The Pellon support of four prints, one from each year 1964–1969, was sampled and analyzed using pyrolysis gas chromatography mass spectrometry. All four samples appear to be the same, containing acrylics (EA: Ethyl Acrylate, MMA: Methyl Methacrylate, EMA: Ethyl Methacrylate) with some cellulosic material (allose). While the acrylics components are relatively stable, it is possible that poor quality cellulose, such as rayon, might be responsible for the pale discoloration noted. The more pronounced local discoloration is likely the result of substandard housings.

The Straus Center was very fortunate to be given and lent three prints on Pellon for research purposes. Various treatment tests were conducted to better understand the effectiveness of standard paper conservation treatments on prints with Pellon supports and to highlight potential risks. The prints had a variety of condition issues in common including planar distortion, deep embedded creases, general pale yellow discoloration, surface soil and tide lines. One also suffered mold damage.

A series of immersion washing treatments in warm deionized water was undertaken and proved successful in reducing the general discoloration and some of the tide lines. The results were supported with colorimetric measurements. Sodium borohydride was used to remove certain tide lines insoluble in water. Much of the significant planar distortion and creasing was related to liquid damage and poor storage and handling. Controlled drying was very successful in reducing this, a result not easy to achieve with screen-prints on paper. The distortion was progressively reduced over a number of washing and drying treatments with a succession of felts, soft thick blotters and then thinner, harder ones used during pressing. It is necessary to swap out the blotters very regularly and to dry the prints over a long period as the support retained a lot of moisture. Care should be taken to monitor dimensional change to the sheets. Minor expansion and contraction was found to occur, approximately 3mm across a 915mm sheet, although it had no adverse effect on the ink layer.

Attempts to reduce the mold staining and surface soil proved less successful. Particulate dirt is easily trapped in the interstices of the relatively open surface structure. A spray application of toned cellulose powder was used to mask the mold spots visible within the mount aperture [FN1]. It was necessary to make two applications, first pale then darker, to cover the staining and achieve the correct color match. Suction was used to prevent local cockling of the support.

Corita signed her prints with a variety of writing materials, some of which proved partially soluble in extended washing treatments and were temporarily fixed with cyclododecane.



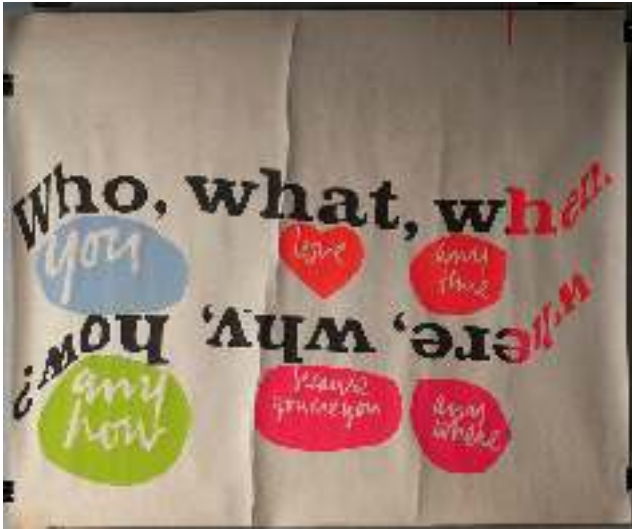


Fig. 5. *Questions and Answers* 1966 Harvard Art Museums TL41188 762mm x 914mm. Before treatment in raking illumination.

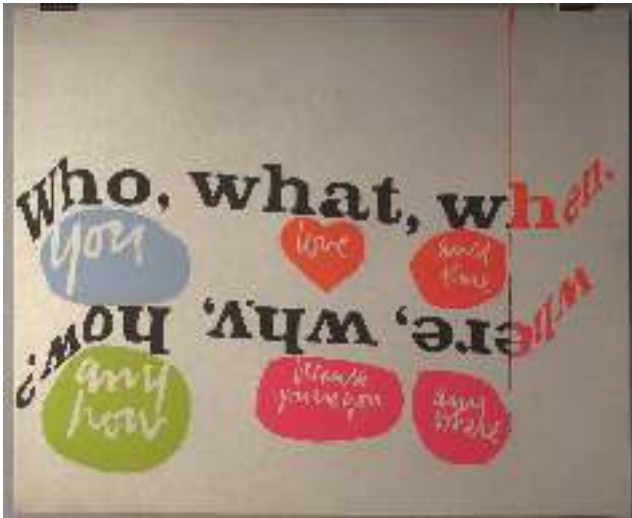


Fig. 6. *Questions and Answers* 1966 Harvard Art Museums TL41188 762mm x 914mm. After treatment in raking illumination.

#### SUMMARY

The micro-fading tester over-estimates the sensitivity of daylight fluorescent inks due to the increase in temperature at the test location caused by the light source. With further research it may be possible to quantify the error to achieve a more accurate indication of the sensitivity of a particular ink. These fluorescent inks still appear bright and vibrant and, while the display history of these prints is not known, the testing suggests that oil-based daylight fluorescent screen-print ink is not in the most sensitive category of colorants.

Treatment tests have shown that it is possible to improve the appearance of prints on Pellon. The most disfiguring damage, the general discoloration and planar distortion, can be successfully reduced with washing and controlled drying (figs. 5–6).

[FN1.] The cellulose mixture was prepared following a recipe described in the workshop notes *Mastering Impainting*, Bernstein and Evans (2003 unpublished). 1g toned sieved Solka-Floc 300 powdered cellulose, 20ml water, 5ml 2% w/v methylcellulose A4C, 5ml isopropanol. The cellulose powder was toned by toasting in a pan on a hot plate, it was then mixed with the water and left to settle. The toned cellulose discolored the water and tests showed that this had the potential to create small tidelines when applied to Pellon with the airbrush. The water was removed and replaced periodically until no more discoloration was visible, the methylcellulose and isopropanol were then added to the mixture.

#### ACKNOWLEDGEMENTS

This research was undertaken while I was the Craigen W. Bowen Paper Conservation Fellow at the Straus Center for Conservation and Technical Studies, Harvard Art Museums. I am very grateful to all the staff at the Straus for their help with this work. I would also like to thank Dr. Jens Stenger of Yale University Institute for the Preservation of Cultural Heritage.

#### REFERENCES

- CIE Technical Report 157:2004. *Control of Damage to Museum Objects by Optical Radiation*. Commission International De L'Eclairage 2004.
- Connors-Rowe, S., Morris, H. and Whitmore, P., 2005. *Evaluation of Appearance and Fading of Daylight Fluorescent Watercolors*. *Journal of the American Institute of Conservation* 44: pp. 75–94.
- Corita Papers, 1936–1992; MC 583, Schlesinger Library, Radcliffe Institute, Harvard University, Cambridge, Mass.
- Hinde, E., Nel, P., Sloggett, R. and Roberts, A., 2007. A Photographic Method For Documenting Daylight Fluorescent Paint. In: Pagliarino, A. and Osmond, G. eds. *Contemporary Collections: Preprints from the AICCM National Conference 17th–19th October 2007 Brisbane*. Canberra: Australian Institute for the Conservation of Cultural Material, pp. 31–36.
- Hinde, E., Nel, P., Sloggett, R. and Roberts, A., 2013. *Fluorimetric Analysis of the Constituent Dyes within Fluorescent Pigments: Implications for Display and Preservation of Daylight Fluorescent Artwork*. *Journal of the American Institute of Conservation* 52: pp. 97–106.
- Karia, M.A., 2013. Mary Anne Karia, discussion of Corita's use of Pellon. [Email] (Personal Communication, 06/25/2013).

Michalski, S. 2013. *Agent of Deterioration: Light, Ultraviolet and Infrared*. [Online] Available at: <http://www.cci-icc.gc.ca/resources-ressources/agentsofdeterioration-agentsdedeterioration/chap08-eng.aspx> [Accessed 6/22/2014]

Oral History Program University of California Los Angeles 1977. *Los Angeles Art Community: Group Portrait. Corita Kent Interviewed By Bernard Galm*. The Regents of the University of California. Tse, S., Ciperia, L. and Leckie, C., 2011. *Microfade Testing to Support Exhibit Decisions: The Catherine Parr Traill Scrapbooks*. Collection Forum 2011. 25(1); pp. 92–106.

Whitmore, P., Pan, X. and Bailie, C., 1999. *Predicting the Fading of Objects: Identification of Fugitive Colorants through Nondestructive Lighfastness Measurements*. *Journal of the American Institute of Conservation* 38: pp. 395–409.

HARRY METCALF  
Conservation Department  
City Museum & Art Gallery  
Bristol, UK  
[harry.metcalf@bristol.gov.uk](mailto:harry.metcalf@bristol.gov.uk)