CASE REPORT

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Using an Alternate Light Source to Restore Writing

REFERENCE: Leaver WL, Smith JW. Using an alternate light source to restore writing. J Forensic Sci 1999;44(3):653–655.

ABSTRACT: This case report will describe the method by which writing that was washed off a bathroom wall was restored. The writing was recovered using an Alternate Light Source. The vehicle/carrier of the removed ink reacted to the ALS but no reaction resulted from infrared examination. The examiners were able to make a permanent record of the lost writing through photographic methods.

KEYWORDS: forensic science, alternate light source, luminescence, handwriting

In many cases, Document Examiners are called upon to "restore" faded writing or erased writing. This paper will discuss a document problem that is a step beyond either of those problems. This document problem involved writing that was not just faded, erased or even washed off, but physically scrubbed off of a wall. Unlike erased writing where there may be a trace of the original writing, there was absolutely no visible trace of the writing remaining on the wall.

A problem was presented to the Document Section wherein an eerie message was written on a metal stall wall of the employees' bathroom of a large store. At first, the message was thought to be a sick joke and the cleaning lady discovering the scrawl was ordered to remove the writing. The handwriting wasn't merely washed off; it was scrubbed off the wall. Several days later, to the horror of the establishment's management, it was discovered that the message might have been related to the possible abduction of a female customer. The police were called and informed of the existence of the message. The normal approach to a problem of restoring writing on a document would be to "raise" the writing photographically using various filters, use of Infrared Reflectance and Luminescence, perhaps use of Ultraviolet Light, or resort to the use of an Alternate Light Source. In many instances, Infrared examination will solve the problem. In this case, Infrared examination and Ultraviolet examination did not reveal any part of the writing. This paper will describe the method by which the "scrubbed" writing was recovered, photographed, and preserved for comparison using an Alternate Light Source.

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Received 1 July 1998; accepted 1 Sept. 1998.

Discussion

In earlier cases, limited research and experimentation had been done in the laboratory by the document section regarding Infrared Reflectance and Luminescence and with the Alternate Light Source. It was found that brilliant luminescent colors were emitted from some inks when exposed to the Polilight. The best results in past experimentation had come from using the Alternate Light Source in the 450 nm to 600 nm excitation range and using the red goggles as a barrier filter. Thus, after attempts to raise the writing failed using Ultraviolet examination and Infrared examination using a system similar to the Richard's IR Camera System (1), it was hoped that the Polilight might perform the same as it had during experiments with ink testing using the Alternate Light Source. What resulted was a photographic record of the writing that had been removed, which was of sufficient quality for comparison. However, the written message could not be observed or captured photographically in its entirety. The reaction to the Alternate Light Source was slight enough that only a few characters showed at best. So the message had to be photographed one and two characters at a time and reassembled as a mosaic.

The Alternate Light Source, Fig. 1, used was a Polilight, Model PL-6. The excitation frequency used was 540 nm. A combination of the low wattage of the light and a sufficiently weak reaction of the ink component to the ALS, made it necessary to hold the ALS sufficiently close to the writing that only one or two written characters could be viewed at a time and thus photographed at a time. This was also probably due to the varying amount of the ink component that was still attached to the painted wall. The reaction was weaker on some portions of the writing even though the light source was held at the same distance and angle. This was believed to be a result of some portions of the writing having been more thoroughly scrubbed from the surface than other portions. Therefore, the portions of the writing that were less thoroughly scrubbed reacted more brightly than the areas of the wall that were more thoroughly scrubbed, because more of a residual trace of the ink remained on the more lightly scrubbed portions of the wall. Figure 2 shows the spotlight effect that resulted from the necessity to view only one or two characters at a time.

The luminescence was sufficiently weak that it was difficult to focus the Nikon N70 35mm Camera. The camera was set on a tripod so the film plane was parallel to the wall. The camera was focussed on the wall under normal lighting conditions using a Wratten No. 25 red filter. As the light wand of the Polilight was moved from character to character, the camera was lined up with the light

FIG. 1—*Polilight.*

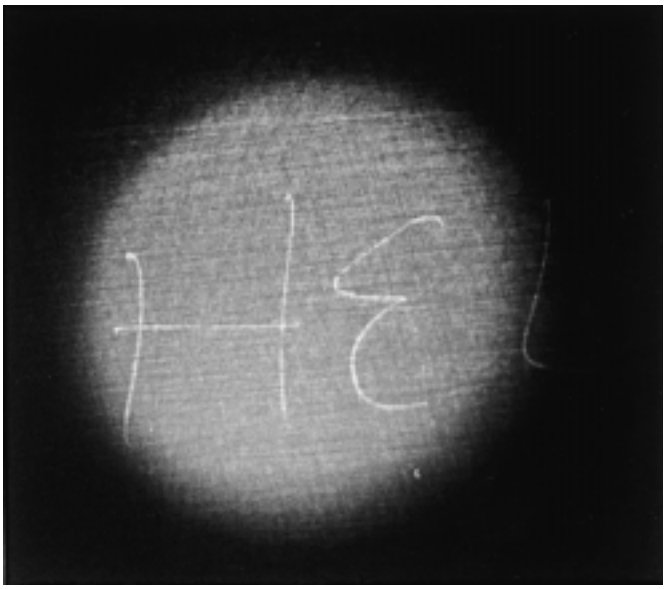

FIG. 2—*Spotlight effect of ALS showing limited number of characters fluorescing at one time.*

wand to photograph each character on Tri-X (ASA 400) black and white film. As the camera was moved along the lines of writing, the same "camera-to-subject" distance was maintained to preclude having to adjust the focus each time and also to keep the writing characters all the same size on the film image.

Alternate methods to photograph the message in its entirety, such as paint-by-light/long exposure as used in nighttime vehicular collisions produced negative results. The excitation light had to be in close proximity to produce a luminescent reaction to the excitation beam.

This method of photographing the writing and having it printed according to scale, facilitated a uniform construction of the mosaic of the writing. With portions of the adjacent letters visible in each photograph, the photographs could be overlaid and cut to keep the letters of each word in proper position and proportion. Thus, the entire message could be reconstructed in the same proportions as it

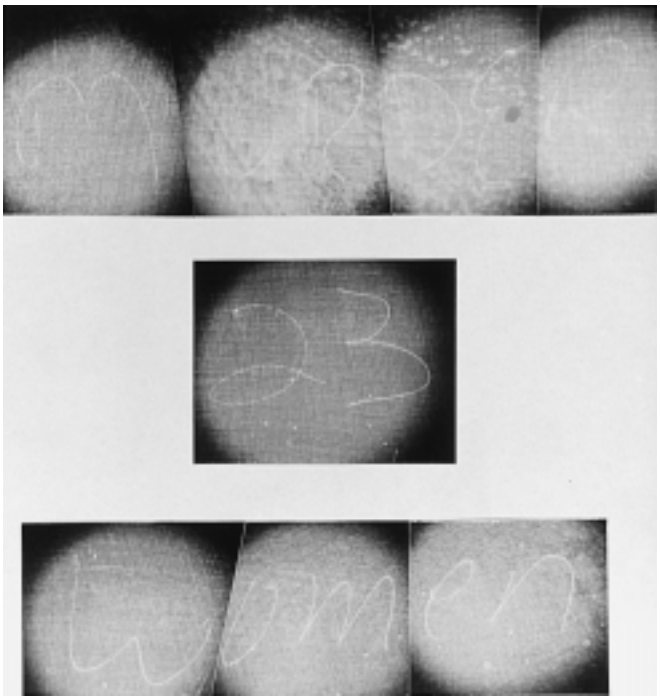

FIG. 3—*Portion of message reconstructed.*

appeared on the wall. Figure 3 shows a portion of the message reconstructed.

Summary

The ALS did not reveal the ink on the metal wall because the ink was removed. A component of the ink, probably the vehicle/carrier of the ink had leached into or been absorbed by the paint on the metal wall. This component is what reacted to the Alternate Light Source and what luminesced when exposed to the ALS, when examination using Infrared Reflectance and Infrared Luminescence methods revealed nothing. Nor did Ultra violet examination show the missing writing. The brilliance of the fluorescence was affected by the intensity of the ALS (2) and the amount of the ink component absorbed into the surface of the painted metal wall.

Comments

Since the reaction occurred in the 540 nm excitation range of the ALS, one might reason that a reaction should have also resulted from using IR Luminescence with an excitation frequency in the same nanometer range. A VSC-4 upper stage was placed directly on the surface of the wall to perform Infrared examinations. The results were negative.

The reaction observed was visible fluorescence. In the limited experimentation in this lab, visible fluorescence was most often observed when bombarding the ink with a blue-green light, producing luminescence visible through a red filter/goggles. The resultant luminescence is emitted at a longer wavelength (less energy) than the excitation wavelength (3).

If an Alternate Light Source is not available, the visible fluorescence reaction can be simulated using the VSC-4. Place an ink sample from a Pilot V-Ball red ink pen or a Flair fiber tip red or purple

pen on the examination stage of the machine. Set the excitation filter at 440-580 and activate the spot illumination. Lift the curtain and view the ink through a No. 25 (red) filter. Thus, bypassing the IR sensitive camera by viewing the ink through the red filter with your otherwise unaided eye, the ink, when placed in the center of the blue-green spotlight, should emit visible brilliant red/orange fluorescence. This can also be accomplished using any sufficiently intense blue-green light as an excitation source.

The methods used to photograph and construct the mosaic of the writing are not as important as the concept that this type of examination and restoration can be done and understanding what physical properties make it possible to accomplish this restoration. As John Paul Osborn said in his interview on *Dateline NBC*, "It's not magic, it's physics."

References

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