

## TECHNICAL NOTE

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# Transmitted Infrared Luminescence in Document Examination

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**REFERENCE:** Gross, E., Sin-David, L., and Almog, J., "Transmitted Infrared Luminescence in Document Examination," *Journal of Forensic Sciences*, JFSCA, Vol. 25, No. 2, April 1980, pp. 382-385.

**ABSTRACT:** A modified infrared luminescence technique that enables the restoration of texts obliterated by certain substances is described. The new method, transmitted infrared luminescence, is based on illumination of the examined document from the rear rather than from the front as in common infrared luminescence. The success of the new technique in actual cases is demonstrated.

**KEY WORDS:** questioned documents, spectroscopic analysis

Infrared luminescence (IRL) for differentiation between inks of similar color and for restoration of erasures is a well-established technique in forensic science laboratories [1]. We would like to report here a slightly modified IRL technique that succeeds in certain cases where the conventional IRL fails.

Questioned document examiners are quite often required to restore obliterated texts that are covered with substances such as blood, white correction fluids, or water colors. In many such cases neither IRL nor other common photographic techniques provide satisfactory results.

The modified technique that we have named "transmitted IR luminescence" was found very useful for such cases. It differs from common IRL in that the illumination of the document under examination is from the rear rather than from the front (Figs. 1 and 2, respectively). Otherwise the equipment is identical to that of common IRL.

### Experimental Procedure

Figures 1 and 2 describe schematically the arrangements for transmitted IRL and for common IRL, respectively.

Several types of paper and ink and two types of erasing materials, blood and Liquid Paper® (one of the white correction fluids), were examined in this study.

The photographic system consisted of a Danoli light box as the white light source, a

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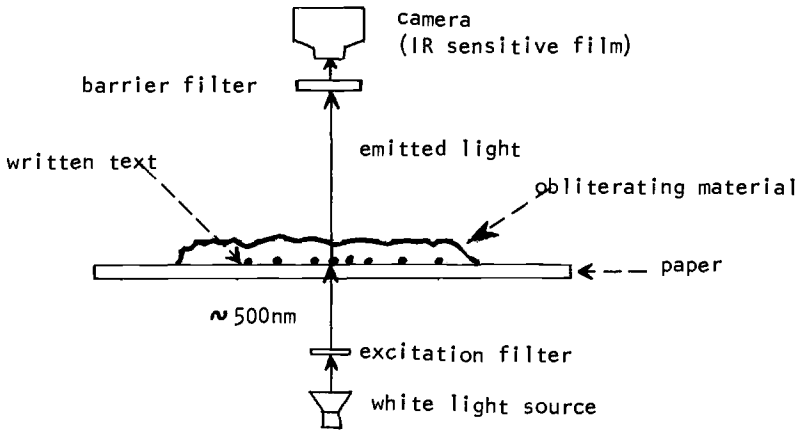


FIG. 1—Transmitted IRL arrangement.

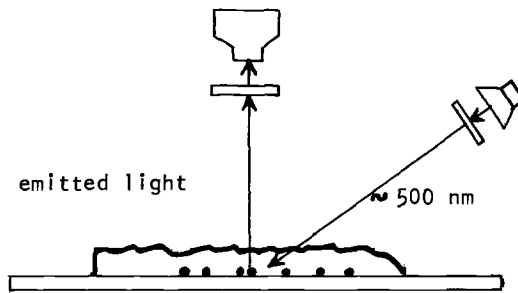


FIG. 2—Common IRL arrangement.

Corning #4784 blue-green excitation filter, a Leitz IR barrier filter, a Pentax SP 11 camera, and Kodak high-speed IR film. The exposure time was approximately 1 min at  $f/2$ .

### Results and Discussion

Figures 3a through 3d describe an attempt to visualize a text written with "Drafton" ball-point pen ink on white stationery paper, totally obliterated by a thick layer of blood. While the common methods of IRL, reflected IR, reflected ultraviolet (UV), and UV fluorescence had hardly any noticeable influence, transmitted IRL made the text fairly readable, the ink fluorescing much more than the paper.

Figures 4a through 4d describe an actual case of illegal alteration. The original address on a government form had been obliterated by a white correction fluid and a new name had been typed on top (Fig. 4a). Attempts to restore the obliterated text by IRL, reflected IR, reflected UV, and UV fluorescence failed, but the original name became very clear on application of transmitted IRL (Fig. 4d). In this case the paper fluoresced but the ink did not.

In general, good results were obtained with obliterated texts on white stationery paper or yellow "legal pads," but only poor results were observed on brown wrapping paper.

The main difference between the common IRL and the modified technique is the substance between the exciting light and the text that has to be excited. In common IRL, it is the obliterating material (blood, correction fluid, and so on) that separates the light

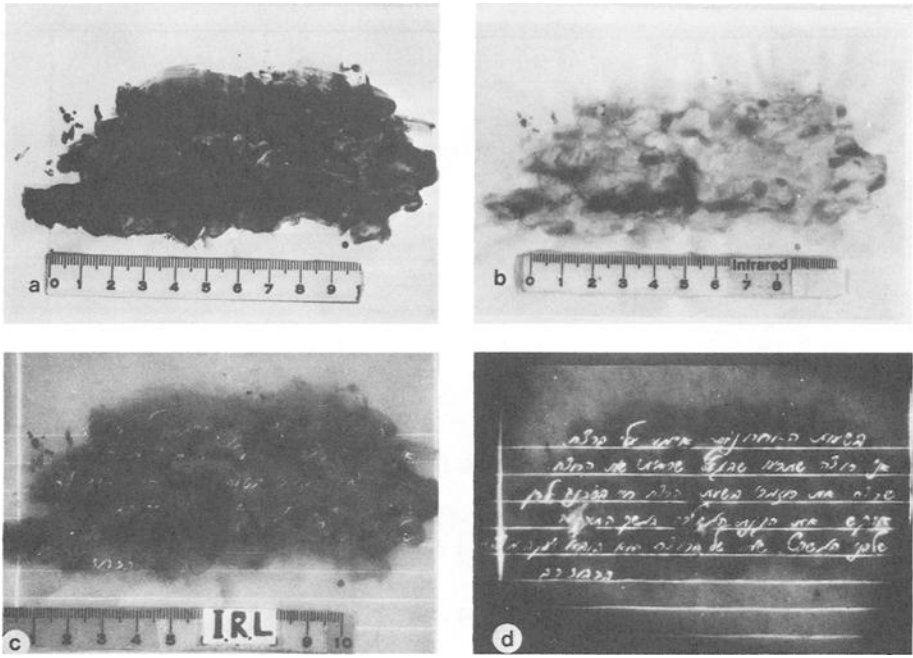


FIG. 3—Photographic experiments on a text covered with blood; (a) regular reproduction, (b) reflected IR, (c) IRL, and (d) transmitted IRL.

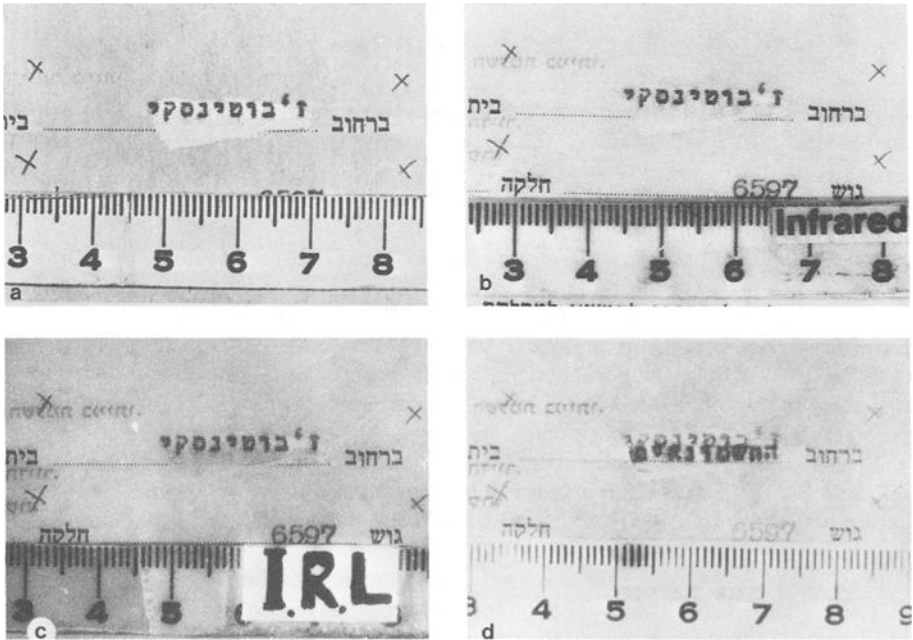


FIG. 4—Photographic experiments on a text obliterated with white correction fluid; (a) regular reproduction, (b) reflected IR, (c) IRL, and (d) transmitted IRL.

source from the text, while in the modified technique it is the paper that separates the two. Apparently the obliterating materials are opaque to the exciting light, thus preventing it from exciting the "target" (the ink or the paper). Paper (white or yellow but not brown), on the other hand, does transmit the exciting light, and the IR luminescence, which is emitted from the target, passes through the obliterating material to the camera.

The modified IRL method has recently become a routine technique in our document examination procedure.

### Reference

- [1] Richards, G. B., "The Application of Electronic Video Techniques to Infrared and Ultraviolet Examinations," *Journal of Forensic Sciences*, Vol. 22, No. 1, Jan. 1977, pp. 53-60.

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