

## TECHNICAL ARTICLE

### Using Infrared Photography to Document Clothing Evidence in the Reconstruction of a Homicide

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#### Introduction

#### Background on Infrared Photography

The use of infrared (IR) photography in forensic casework has been well documented in the forensic literature. It has primarily been used for the documentation of gunshot residue patterns and blood staining on dark colored clothing (1, 2), although it has also been used for the photography of latent tattoos and for the characterization of different types of inks. The principle behind the infrared photography of blood stains is that many dyes and fabrics reflect a large amount of infrared radiation, whereas blood stains absorb most wavelengths of visible light (400-700 nm) and near infrared light (700-900 nm). This results in the fabric appearing gray or white with the contrasting blood staining darker in color. The enhanced contrast between the fabric and the evidence (blood) allows the examiner to better interpret the evidence and assists in sample selection for further testing (i.e. phenolphthalein, DNA). This technique is especially useful due to its non-destructive nature, its lack of interference with serological/DNA testing and its relative simplicity to perform.

As a brief casework example, Figure 1 shows a shirt which was submitted to the serologist for blood stain interpretation and testing. Due to difficulty visualizing the staining in contrast to the fabric, a request was made for infrared photography. Figure 2 is the IR photograph of the shirt, which clearly shows the blood staining in contrast to the fabric of the shirt. This image allowed the serologist to visualize locations on the item that were most likely to provide probative samples for further testing and interpretation.



**Figure 1. Image of shirt before IR photography.**



**Figure 2. Image of Shirt after IR photography.**

### Description of the Case

On January 3<sup>rd</sup>, 2012, the Sarasota County Sheriff's Office received a 911 call and responded to an area in the woods in Sarasota, Florida. When deputies arrived, they were met by an apparent eyewitness who led them to a camping area shared by himself, the suspect and the victim. Reportedly, the three men were drinking rum and cooking a meal over a camp fire when an argument occurred between the suspect and the victim that resulted in the death of the victim due to injuries inflicted with a machete. The witness was believed to have called 911. The suspect was apprehended shortly after the incident in the vicinity of the campsite.

The victim sustained sharp force injuries to the right side of his face and neck, which included breaching of arteries. This resulted in projected blood stain patterns manifested as arterial spurting and saturation of blood on the ground at the campsite in an area between the campfire and the sheltered tent. The saturation blood stain pattern on the ground in this area indicated the location of the victim when depositing blood. A machete, located in a campfire near the site of the attack, was believed to be the murder weapon (Figure 3).

Also, near the campfire and the site of the attack, was a white plastic chair in which the suspect was believed to have sat and was known to be his chair. This chair exhibited a pattern of near circular projected blood stains, with many of the stains having been altered while wet (Figure 4). There were also small projected blood stains on the left side (as seated) of the backrest of the chair that exhibited downward directionalities.

The witness stated that he was standing close to the victim at the time of the attack and that afterwards, the suspect ordered the witness to take off his shirt and to place it in the campfire. An examination of the campfire, once the flames had subsided, yielded no apparent fabric or similar material. The witness also stated that he was unsure if the suspect changed clothes after the attack and at one point described the suspect as wearing denim pants. At the time of apprehension, the suspect was wearing a pair of black cargo pants. In order to reconstruct aspects of the incident and account for the locations of the suspect and witness during the attack, a blood stain pattern examination was conducted on their clothing as well as the bloodstain patterns located at the scene. This included the use of infrared photography to document the staining on the suspect's black cargo pants.



**Figure 3. Overall image of campsite showing machete in the fire, site of attack denoted by pool of blood and chair in which the suspect was believed to have sat.**



**Figure 4. Seating portion of chair closest to point of attack exhibiting bloodstains.**



## Materials and Methods

A Fuji IS-Pro was used to photograph the cargo pants with a Peca #906 (87A) lens filter. This filter blocks out all visible wavelengths of light and only allows infrared wavelengths to pass through to the camera's detector (Figure 5). Photographs were taken using a remote shutter release, with the camera placed on a tripod positioned at a 90 degree angle to the fabric. Normal copy stand lights provided lighting since they have high emission in the infrared region of the electromagnetic spectrum.

On the camera itself, the live image preview mode allowed adjustment of the camera settings required to get a suitable image since the color of the filter prohibits direct focusing of the lens and alignment of the item. This mode allows for adjustment of the brightness of the image and focusing on the L-shaped ruler.

Adobe Photoshop CS5® was used to crop and invert the image of the seat of the pants for comparison to the image of the chair. Photoshop was also used to make both images 1:1 for comparison using the scales in place on the pants and the chair.

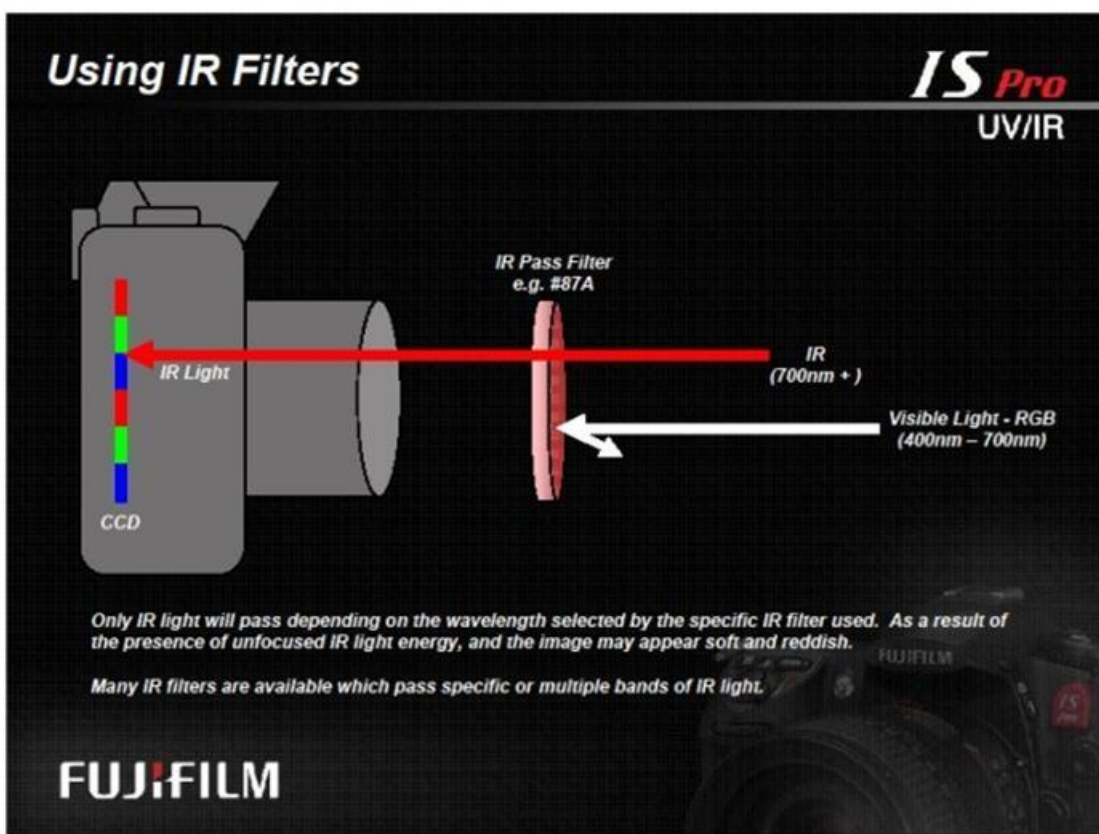


Figure 5. Diagram showing how infrared radiation passes through the lens to the camera's detector.

## Results and Discussion

A blood stain examination of the clothing from the witness showed that he was in proximity to the victim when arterial spurting occurred. This was due to the presence of projected blood stain patterns on the front legs of his blue jeans and shoes. This physical evidence confirmed what the witness said about his location when he was originally interviewed.

Examination of the suspect's cargo pants yielded the following types of staining. The front of the pants exhibited two small spatters near the right thigh pocket and small spatters on the lower right leg. The backside seating (buttock) area of the pants exhibited a pattern of near circular to circular stains in the size range of approximately 2.0 to 7.0 millimeters. The size and distribution of these stains within the pattern were similar to a projection mechanism. Some of the stains had been altered (wiped) as the result of motion while being deposited. Presumptive testing for blood on one of these stains was positive.

Given the conflicting information from the witness with regards to the suspect's clothing, it was important to document this pattern as closely as possible. Although some of the stains were visible to the naked eye, not all provided suitable contrast; hence the need to use IR photography (Figure 6).



**Figure 6. Backside portion of pants worn by suspect before IR photography.**

After development of the IR images, a correspondence was noted between the projected staining on the backside of the pants and the projected staining on the seating area of the white plastic chair closest to the point of attack. The staining on the pants was determined to be a transfer pattern from the projected blood stain pattern on the seat of the white chair and resulted from the rear of the pants contacting the seat when the blood stains were wet. Approximately 16 stains on the rear of the pants corresponded with stains on the seat of the chair thereby allowing for a physical “match” to be made (Figure 7). In addition, there were similar corresponding altered stains as the result of wiping between the two surfaces. By using IR photography and performing a physical comparison, it was shown that the suspect was likely wearing the pants at the time of the attack and sat in the chair shortly after the blood had been deposited.



**Figure 7. (Top) Backside portion of pants worn by suspect after IR photography. (Bottom) Seating portion of chair also shown with corresponding stains circled in green in each image.**

## Conclusion

Using IR photography for the documentation of blood staining on dark fabric has been well reported. However, this technique is probably under-utilized in the examination of clothing for blood stain patterns and is one that should be considered in every relevant case. The technique is relatively simple, is non-destructive and does not require the use of blood enhancement reagents which may interfere with further DNA testing. In this case, not only was it useful in providing better contrast between the stains and the color of the fabric, but it allowed for a reconstruction of events in a homicide case and provided probative information for comparison to statements made by the witness.

## References

1. Chaklos, D., and Davis, A., Visualization of gunpowder residue patterns using a digital infrared camera and optical filters, *AFTE Journal*, 37(2), 2005.
2. Perkins, M., The application of infrared photography in bloodstain pattern documentation of clothing, *JFI*, 55(1), 2005.

## Acknowledgement

Thanks to Don Hayes of the Boston Police Department Crime Laboratory for permission to use Figures 1 and 2 as taken in casework by one of the authors. Also thanks to the Sarasota County Sheriff's Office for approval to use this case for publication.

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