



### E39 A Bloodstain Pattern Analysis (BPA) Approach to the Shroud of Turin: A Step Forward

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After attending this presentation, attendees will understand how a Bloodstain Pattern Analysis (BPA) could be performed on the Shroud of Turin to reconstruct the original position of the man impressed on the linen.

This presentation will impact the forensic science community by demonstrating the new developments and potential of the BPA approach on uncommon pieces of evidence, suggesting further evaluation of one of the most controversial and valuable Christian relics.

Some of the presumed blood stains from the crucifixion wounds on the Shroud were approached forensically to reconstruct the body position during the blood flow, the crucifixion, and the ancient death penalty practice. A previous analysis presented the reconstruction of the position of the condemned with the hands above the head (arms/body angle near 80°).<sup>1</sup>

Part of this new study focuses on the possibility of being nailed to a simple pole and not to the horizontal branch of a cross (patibulum), as proposed by biblical interpretation. The end of a transfusion cannula, connected to a drip chamber, was fixed at the wrist at Destot's space to simulate the bleeding from a puncture-type injury where it is usually believed that the nail for the crucifixion was positioned. Real human blood and synthetic blood for BPA were used with comparable results.

A ballistic angle finder was used, measuring the forearm-body angles when the hands are directly above the head (110° and 130°). In these cases, the blood trickled down on the radial part of the forearm, opposite to what is observed on the Shroud.

To verify whether the rivulets could be generated by a postmortem bleeding, the subject was laying with his hands crossed on the pubis, therefore the blood flow was in the same pattern as in the Shroud. Tests with different angle of the support surface (-5°, 0°, +5°) have been performed.

In none of these positions did the rivulets run as on the Shroud, but flowed parallel to the forearm for a few centimeters, then dripped toward the lateral or medial side of the forearm. The rivulets also never ran at an angle comparable to the two shorter stains located on the back of the left hand of the Shroud.

To investigate the shape of the nail wound on the hand and the two short rivulets, a preliminary test was set up to simulate the bleeding on contact with a wood surface, like the patibulum. Synthetic blood (0.3mL) was applied onto the back of the hand of a living volunteer; pieces of wood with different textures (from bark to smooth finish) were pressed on the hand for ten seconds and the resulting pattern observed. The results were not conclusive, since the wound is not clearly decipherable and in some cases the texture of the wood left its own imprint. This result underlines how difficult it is to speculate on the actual location of the nail's exit wound based on the imprint on the Turin Shroud.

In addition, this study set up a first BPA for the spear wound on the chest. On a mannequin's torso, a sponge with the same dimension of the wound was soaked in synthetic blood and then pressed at the corresponding area. In a standing position, according to the theory of the bleeding on the cross, vertical rivulets flow only on the front of the torso, with a shape congruent with the Shroud image.

Other theories suggest that the "blood belt" on the back of the image was the result of a postmortem bleeding of the subject after the removal from the cross. On a horizontal torso (support surface angle -5°, 0°, +5°), the rivulets flow sideways and posteriorly to the scapular region, where they form a large pool absorbed by the fabric and create a corresponding imprint on the body. All of this evidence is completely non-consistent with the features on the Shroud. Further studies should be performed on this topic.

New in-depth analyses on the presumed bloodstains on the Shroud of Turin will be presented, corroborating the previous results regarding the arm positions and illustrating some inconsistencies regarding the other red stains. Further BPA evaluation is highly recommended to better understand this controversial relic and the crucifixion as a death penalty.

#### Reference:

1. Borrini & Garlaschelli. A BPA Approach to the Shroud of Turin: A Preliminary Examination of the Left Forearm to Reconstruct the Crucifixion Practice. Proceedings of the American Academy of Forensic Sciences, 66th Annual Scientific Meeting, Seattle, WA. 2014.

#### BPA, Shroud of Turin, Crucifixion

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