

Abstract Submitted
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Impact and imbibition of blood drops with textiles: Where does this stain come from?¹ DANIEL ATTINGER, RICHARD FAFLAK, Iowa State University — Forensic investigators are sometimes asked if a given stain on fabric could have originated from a blood source at a specific relative location. A wide range of values of the maximum distance that a blood drop can travel have been reported, from less than one meter to more than 10 meters. The formation of bloodstains on fabrics can involve fast atomization mechanisms, flights of deforming droplets, and capillary interactions of a complex fluid with a multiscale substrate. Here we solve the above forensic question with fluid dynamics and inverse data search. Fluid dynamic simulations involve Newton's equation of motion, models for aerodynamic drag forces on deformable particles, and an in-house capillary model of blood wicking in fabrics. Key parameters are the drop size, launch velocity and launch angle. It is assumed that the ambient air is quiescent, and that stains exhibit similar areas on the front and back of the fabric. The latter assumption is verified for stains larger than the fabric thickness. Simulation results are then mined for the stain size, a parameter directly measurable on a crime scene. Experiments of blood spattered on fabric are in agreement with the simulation results. Findings are presented in a simple chart which discriminates whether a stain of specific size, on a specific fabric, can originate from a blood source at a specific relative location, or not.

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