



**CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY**

Name(s) Kaylie A. Ward	Project Number S0326
Project Title CSI: Comprehensive Spatter Investigation	
Abstract Objectives/Goals The objective is to determine how accurately one can calculate the impact angle of a drop of blood based on bloodstain measurements, and how the characteristics of the target surface affect bloodstain formation. Methods/Materials In the first experiment, I dripped 4 blood drops onto paper samples for each known angle (10°-90°). I then performed trigonometric calculations, averaged them, compared the result with the known angle, and noted the differences between the known angles and calculated angles. In the second experiment I dropped blood onto various surfaces with different textures and analyzed them through the use of high-speed video. I documented the differences in the shapes of the bloodstains and noted which would be appropriate for angle calculations. Results Experiment 1: The largest error occurs at 90°. 30° and 40° are the values that show both precision and accuracy. Measurements at 60° and 20° show the most precision but are not accurate. Experiment 2: Only relatively smooth surfaces produced bloodstains that would be suitable for angle calculations. While the wood surfaces are smooth to the touch, they have fibers that cause the blood to disburse in an irregular pattern along the wood grain. The cloth sample scattered some of the blood and absorbed the rest. The asphalt and concrete had very rough surfaces and caused the blood to, in a sense, shatter and disburse in random patterns. Conclusions/Discussion Calculating impact angles from bloodstains is possible from well-formed stains. The accuracy of such calculations is dependent on the angle measured, the accuracy of the bloodstain measurements and the smoothness of the surface impacted. If a surface is rough or fibrous, the bloodstains will be irregular and thus, no longer suitable for angle calculations.	
Summary Statement CSI: Comprehensive Spatter Investigation is meant to determine how accurately one can calculate the impact angle of a drop of blood by analyzing bloodstains using trigonometric functions.	
Help Received Father helped film the experiment while in progress and print the board once complete; Used equipment at Biodynamics Engineering Inc. under the supervision of Parris Ward.	