



### **B157 Evaluation of the Collection of Mathematical Facts in Bloodstain Pattern Evidence**

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After attending this presentation, attendees will gain an understanding of the flaws to mathematical reasoning with regard to the Reconstruction of the Origin in Bloodstain pattern evidence.

This presentation will impact the forensic community and/or humanity by making those involved with bloodstain patterns re-evaluate mathematical logic and firearms comparative continue studies which will help correct and validate the use of techniques in reconstructing the origin of blood dispersing events.

After attending this presentation, attendees will be aware of updated principles and logic which can lead to a better foundation for the method-ology in Reconstruction of the Origin in Bloodstain pattern evidence. Prevailing rationale involves serious flaws which must be addressed before corrections can be developed.

This paper will impact the forensic community and/or humanity by identifying errors in logic and misapplications of mathematic theorems used in the procedure of reconstruction of the origin in bloodstain pattern evidence. A preliminary series of experiments involving firearms dispersed blood drops was conducted to investigate the effects of blood drop velocity with the format to be made available to attendees wishing to continue these studies.

Introductory phrases such as “we all know...” and “it has long been accepted...” are encountered with presentations regarding bloodstain pattern evidence. Some of these concepts are based on flawed logic, yet review of scientific principles is omitted due, perhaps, to a lack of respect toward the evidence. Some scientists, even those working in the field, still claim that bloodstain pattern evidence is *all* subjective.

Bloodstain pattern evidence originated from careers not requiring technical academic background. Dr. Paul Kirk saw the potential in a more scientific approach from his awareness of European studies, which he brought to the US. Instead of carrying on and expanding upon Dr. Kirk’s work, those who followed deviated from his concepts to apply their own interpretations. His death may have prevented intervention in the development of some erroneous logic. Beginning with Dr. Kirk’s casework and court testimonies, a preoccupation has existed with qualifying the evidence as a science discipline. This is now of less concern.

Mathematics and physics were the standards in acceptance during the 1940s through 1980s, when bloodstain pattern analysis was being taught and it gained popularity with investigators. An association between math, physics and bloodstain patterns became essential in order to justify expert testimony in cases where bloodstains were of evidentiary benefit to the adversary process. Because the value of the evidence was considered more important than questions regarding why applications worked, challenge to accuracy of logic was ignored.

The current requirement for review of bloodstain pattern evidence mathematical principles is analogous to a quote from a French pioneer chemist: “A science is built up with facts as a house is with stones, but a collection of facts is no more a science than a heap of stones is a house.” (Jules Henri Poincare (1854-1912), quoted by Bernard Russell in preface to *Science and Method*, 1913).

The statements: a line bisecting parallel lines creates equal angles, a right triangle can be constructed between two parallel lines, and the measurements of a blood spatter stain can be related to the dimensions of the drop that left the stain, are all part of a collection of facts which may not have any connection to the scientific process defined in a method, yet the technique appears to work when applied to mock crime scenes. Suggestions are presented to explain why it works and the result of a preliminary study given which will increase understanding of more applicable logic.

One of the major factors in the appearance of a bloodstain—the speed of the blood drop at impact with a surface—has routinely been ignored. The success of using the technique with beating mock scenes was evaluated by comparing with a series of mock scenes constructed using single gun- shots into human blood at the California Highway Patrol Academy Firearms range near Sacramento, California. The results were evaluated for measurement of blood spatters by two methods: completing the oval and bloodstain pattern training technique (BPT). Other points were evaluated in regard to reconstruction of the contact between the bullet and the blood source, where possible. The importance of correct construction of the area of convergence was noted as well as the benefits of using confirmatory information with the mathematical technique.

Conclusions show a need to continue the evaluation of methods, comparing mock scenes with real ones, and re-evaluating the use of oval or ellipse cut off points for bloodstain measurements.

**Bloodstain Patterns, Crime Scene Reconstruction, Identification Training**