B45 An Evaluation of the Trigonometric Model for Point of Origin Prediction in Bloodspatter Pattern Analysis

Anna S. Duggar, MS, and Rose R. Duryea, MA, New Orleans Police Department Crime Laboratory, 2932 Tulane Avenue, New Orleans, LA 70005*

After attending this presentation, attendees will learn the responsible use of the trigonometric model in applied fieldwork and the value of training by a qualified expert.

The discipline of bloodspatter pattern analysis continues to need peerreviewed scientific and statistical studies, particularly on essential methods. This presentation will impact the forensic community and/or humanity by meeting that need and providing quantitative arguments for training and responsible method implementation.

The discipline of bloodspatter pattern analysis continues to need peerreviewed scientific and statistical studies, even on premises as essential as the trigonometric formula historically used in the back-calculation of a point of origin from individual droplet stains in an impact pattern. Structured, objective scientific research in this field in the last two decades has shown that even the most basic assumptions are subject to change as understanding of the science is explored. In addition, recent judicial challenges to the testimony of the bloodspatter analysis expert as neither scientifically valid nor admissible, combined with *Daubert* challenges to other pattern analysis fields of the forensic sciences, have produced a demand for statistical support for the conclusions of the expert analyst. The experiment presented here describes the confidence interval and relative accuracy of the trigonometric calculation used in point-of-origin reconstruction for bloodspatter patterns.

To best test the mathematic model, it was necessary to produce a large number of stains at a known, constant angle. To this end, an apparatus was built allowing for controlled replication of single droplet patterns in bovine blood at a range of incident angles between zero and 80 degrees. The stains were then measured by multiple researchers, both trained and untrained, and the length and width measurements compared. These measurements were used to calculate the angle of incidence using the formula $\angle_{incidence} = \cos^{-1}(d/D)$. The error of the calculated angle as compared to the recorded angle was determined through scatterplots and other statistical analysis.

Results support the conventional wisdom that as the ratio of width to length of the stain approaches 1.0 (impact angle approaches 90 degrees), calculations become less reliable. The impact of even minimal training by a qualified expert is demonstrated, and comparison of the range of calculated angles to the ideal calculated angle provides new insight into the responsible use of the trigonometric model in the field.

Bloodspatter, Bloodstains, Statistics

 ** Presenting Author*