A196 Statistical Aspects of the Forensic Source Identification Problem

Christopher P. Saunders, PhD*, 2320 16th Avenue, S, Brookings, SD 57006; Joshua Dettman, PhD*, 2501 Investigation Parkway, Quantico, VA; and JoAnn Buscaglia, PhD*, FBI Laboratory, CFSRU, FBI Academy, Bldg 12, Quantico, VA 22135

After attending this presentation, attendees will have a greater understanding of the current trends in statistical evidence interpretation, which will foster better communication between statisticians, evidence interpretation experts, and the broader forensic science community.

This presentation will impact the forensic science community by improving communication between these experts and should assist in the development of statistically sound, rigorous methods of interpretation that are appropriate to the diverse needs of the U.S. forensic science and legal communities.

In 1977, Dennis Lindley, with Ian Evett, introduced modern Bayesian methods for forensic evidence interpretation to the forensic science community. This and related approaches have dominated the academic research related to the interpretation and presentation of forensic evidence; however, in recent years there have been number debates, in both academic circles and forensic communities, related to the applicability of these methods in the U.S. judicial system.

Broadly speaking, these methods require the explicit statement of two mutually exclusive, but non-exhaustive, propositions about how the evidence in a given situation has arisen; one usually corresponding to a defense proposition and one corresponding to a prosecution proposition. Using this approach, once these propositions have been defined and the evidence has been collected, the forensic science expert is then required to present the evidence in a concise and transparent manner so that a decision maker can ultimately decide between the two proposed models of how the evidence has arisen.

Commonly, the evidence that a forensic scientist has available to evaluate between the two propositions is generally one of the following forms: (1) a trace of unknown origin; (2) a sample from the specific source specified by the prosecution hypothesis; or, (3) a collection of samples from the alternative source population specified by the defense proposition. In certain applications, the choice of the alternative source population will be mandated by available databases or, in extreme situations, there will be no such samples available.

This presentation, will review some of the common sets of propositions and statistical approaches that forensic scientists use to characterize the support that the evidence provides for deciding between the prosecution and defense propositions. Discussion will also include how the various sets of competing propositions can be addressed with the commonly available evidence. The general approach will be illustrated with examples that arise in trace element analysis of high purity copper and glass evidence.

Statistics, Evidence Interpretation, Trace Elements