



B94 Interdisciplinary Forensic Investigations—Combining Evidence in Complex Cases

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Learning Overview: This presentation addresses the combination of evidence in interdisciplinary casework investigations to improve assistance to the courts in using the combined value of this forensic evidence. Attendees will learn how this can be accomplished and how this functions in practice.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by demonstrating the strength of forensic science in the use and reporting of combined evidence to the courts.

Single forensic expertise results are already relevant in police investigations and court cases. However, combining results from various expertise areas often contribute even more than the single expertise results. The question is, of course, how to combine these results.

This presentation will address the combination of results from complex interdisciplinary casework investigations at the Netherlands Forensic Institute (NFI) by certified experienced experts (three certified experts out of a population of 136 NFI experts). These three experts have had additional training to be an expert in combining results from specific expertises (pathology, toxicology, DNA, fibers, glass, Gunshot Residue (GSR), guns, digital evidence, etc.). Two other experts are presently trained for this role.

A combined expertise report is produced in these interdisciplinary casework investigations in which the combination of results from the separate disciplines is evaluated using at least two mutually exclusive scenarios, as agreed on by both the prosecutor and the defense. Often, results from the separate expertises need to be re-evaluated under these scenarios, common to all disciplines. Sometimes additional investigations are instigated. Previously, results from each single expertise have generally already been reported separately at source level using scenarios that are tailored to the strength of the specific discipline.

The interdisciplinary scenarios are mostly at the so-called activity level. Currently, the evaluation and reporting of forensic evidence at the activity level is one of the major challenges for the forensic community. Much has been written already on activity level evaluation for trace evidence, such as DNA, fibers, glass, etc. Bridging the gap between source level and activity level interpretation is still a major challenge, however. It promises to bring a wealth of possibilities for a more formal interdisciplinary approach to the evaluation of forensic evidence. In this presentation, a methodology is proposed for the evaluation of interdisciplinary evidence within the likelihood ratio framework.

Prosecution and defense scenarios are analyzed for forensically verifiable “core elements” (often offense-related activities in the case) for which activity level core propositions are formulated. Evidence schemes are introduced in which two main types of evidence relations are identified: serial and parallel evidence.

The evidential value of a serial evidence chain is analyzed in detail and shown to be at least as strong as the weakest link in the chain. Parallel evidence chains from one or more forensic disciplines evaluated in light of the core propositions may be combined, taking into account possible conditional dependencies.

The likelihood framework in combination with the evidence schemes allows the expert to combine interdisciplinary evidence in a probabilistic but still intuitive manner. Assumptions and choices are made in a transparent way. If conditional dependencies are present, a Bayesian network may be set up to take into account these dependencies.

At the NFI, these interdisciplinary reports are reviewed by a team of experts: both the experts for the original expertise areas from which results are used in the report, another interdisciplinary expert, and one of the NFI principal forensic scientists.

Specific examples will be presented on how this approach is applied in casework investigations. The present approach is the result of NFI’s experience over the past 20 years in combining results in interdisciplinary casework investigations in one form or another.

Interdisciplinary Investigations, Combining Evidence, Activity Level