B35 Developing Investigative Leads Through Trace Evidence

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After attending this presentation, attendees will learn how the application of advanced trace evidence techniques can provide investigative leads to cold cases, fresh cases and cases with limited amounts of evidence.

This presentation will impact the forensic community and/or humanity by demonstrating the formulation of investigative leads through trace evidence in criminal investigation has a history of lore in both historical examples and Sherlockian fiction, but it is rarely, or at best, sporadically employed to the benefit of cold cases and is almost never applied to fresh investigations when trace evidence is most readily available. It is hoped that the examples presented here will provide both scientists and investigators with a renewed appreciation of the information and benefits that trace evidence can provide in an investigative examination.

While part of this can be ascribed to financial constraints and the reliance placed on DNA evidence, probably the largest reason can be attributed to the fact that investigators are not necessarily aware of the information that can be extracted from trace evidence. Furthermore, the extents to which an analysis of trace evidence can be taken by an analyst, or the depth of interpretive information that can be extracted from the sum of available evidence is not necessarily encouraged by the segmented design of many forensic laboratories in which scientists are permitted or certified to analyzed only a particular category of evidence.

As opposed to the more familiar comparative type cases in which known and questioned evidence must be associated, a case requiring the development of investigative leads typically has no suspect and often has limited “unknown” evidence. In these cases, a scientist is required to develop testable hypothesis as to the origin of any evidence that has been recovered. These hypotheses take the form of descriptive postulations about the sought-after suspect, their environment, and their history. In these examinations, the freedom for an investigating scientist to be allowed to interrogate and integrate all available evidence is critical, as is a required familiarity with these materials, particularly because of the small amount of sample often available. These materials can include, among other items, hair, fibers, paint, rubber, soil, industrial dust, pollen, and other botanical matter. Equally important to the identification of these materials is the continued analysis that provides further differentiation. For example, if calcite is located, in what environment did it form? Was it formed as a marble, a detrital mineral, in an evaporate environment, or as a pigment/filler? A solid familiarity with materials will allow the identification of a certain particle to be further specified to a particular end-use. It is only by taking an identification beyond the preliminary recognition of an item as “paint” or “wood” and further characterizing it as an “Ford automotive paint” or a “sugar maple – *acer saccarum*” that the reason a particular particle of evidence may be relevant.

These and other approaches towards the production of evidentiary leads will be illustrated through various cases in which trace evidence has provided investigators with actual leads that have lead to consequential arrests, confessions and convictions. Each of these examples will be illustrated by explaining the background information provided to us, the analytical approaches utilized, and most importantly, the way in which the evidence identified was interpreted to provide investigators with a picture of relevant events and processes. All of these cases will illustrate the importance of all-inclusive analyses that violate the traditionally established scientific disciplines. It is hoped that these examples will provide both scientists and investigators with a renewed appreciation of the information and benefits that trace evidence can provide in an investigative examination.

Investigative Leads, Microscopy, Trace Evidence

 ** Presenting Author*