



B119 The Evolution of Forensic Household Dust Analysis Over the Past Century

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After attending this presentation, attendees will recognize how forensic household dust specimens are formed and how the fibrous components form a cage-like structure that acts as a snare, which in turn entraps an array of human and animal hairs, natural and synthetic fibers, and an assortment of particulate materials. Attendees will learn about the development of techniques used to study household dust specimens in the forensic laboratory over the past century and the probative value of household dust specimens.

This presentation will impact the forensic science community by demonstrating the probative value of an underused form of physical evidence — forensic household dust specimens.

In the late 19th century, Hans Gross, a German magistrate, speculated in his writing that dust is a representation of a person's environment in miniature. Gross further proposed that by recognizing the constituents composing a particular dust sample, one could estimate the surroundings from which the dust originated, and that this information could be used to help solve crimes. At approximately the same time, the importance of trace evidential material in solving crimes was being popularized by Sir Arthur Conan Doyle through his fictional character, Sherlock Holmes, who solved many mysteries by reconstructing the events of the crime from dust traces left at or taken away from the crime scene. Gross's and Conan Doyle's writings are believed to have inspired many European and American scientific detectives to look for valuable dust clues while investigating crimes.

In the early 20th century, Edmond Locard established a police laboratory in Lyon, France, and soon his ability to solve crimes by analyzing the dust found on a suspect became known throughout the world. Locard's successful implementation of scientific methodology in criminal investigations and his belief that dust analysis could link every criminal to his or her crime are probably responsible for the use of trace evidence in contemporary times. Moreover, his work served to spur the development of forensic laboratories throughout the world.

Between 1910 and 1970, forensic laboratories were developed in France, England, Sweden, Germany, Switzerland, and Austria as well as the United States. In the early 1930s, a national crime laboratory was maintained by the Federal Bureau of Investigation (FBI) in Washington, DC.

During this era, forward-thinking scientists and scientific investigators such as Edmond Locard and many others throughout the world advanced the use of microscopic trace evidence and the analysis of dust traces to solve crimes and reconstruct events.

As postulated by Edmond Locard, the ultimate goal of trace forensic evidence in a criminal investigation is to identify the people, places, and things involved in the commission of the crime. A commonly encountered but often ignored form of physical evidence, traces of household dust, has the potential to achieve these goals. Dust bunnies, as they are often called, should be a unique entangled conglomeration of fibers containing a variety of inorganic and organic particulates from the immediate environment that are formed over time. Thus, in principle, if one or more

dust bunnies are found associated with a crime, it should be possible to positively identify the location from which it originated and maybe the people involved in the event.

In the past few years, several papers have been presented which demonstrate that household dust specimens may in fact be unique to a given location. These preliminary studies have focused on developing a rapid microscopic method for tabulating the materials, such as animal and human hair, natural and synthetic fibers, and the particulates commonly found in household dust specimens.

The data collected in prior studies and for newly acquired specimens was tabulated on a revised dust tabulation data sheet specifically designed for this study. The newly acquired and previously acquired data study was combined and subjected to rigorous statistical analysis. A number of interesting trends were found, extensively studied, and reported.

A subsequent study postulated that the probative value of household dust specimens would be enhanced not only if the room could be identified by its material makeup but also by the habitual occupier(s) of the room. Thus, the latest study focused on both the common materials present in the dust and the materials from the occupant(s), which is trapped inside the dust bunny (likely originating from the habitual occupier of the room). Promising results were statistically evaluated and reported.

It is believed that the combination of these different approaches will greatly enhance the discriminating power, as well as the probative value, of household dust by enabling one to not only identify a location, but also to identify its habitual occupant(s).

Edmond Locard, Household Dust, Trace Evidence