



B74 Evaluation of Anomalous Data

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The goal of this presentation is to remind forensic scientists and criminal investigators of the importance of critically evaluating evidence recovered from crime scenes to determine its proper significance within the context of the overall scene. Items recovered at a scene may be critical in determining the facts of an investigation, or may lead investigators to draw erroneous conclusions. A case study will illustrate the serious consequences associated with improperly interpreting anomalous evidence.

This presentation will impact the forensic community and/or humanity by serving as a reminder of the importance of critically evaluating forensic evidence in the context of the totality of a scene.

The proper evaluation of forensic evidence requires assigning a "weight" to the importance of each piece of evidence. Investigators must decide the significance of each item recovered from a crime scene. Many scenes, and particularly fire scenes, present anomalous and sometimes conflicting data that must be carefully considered to determine what role, if any, they play in establishing a scene fact pattern. The investigation of fires, like most historical reconstructions based on science, requires investigators to gather evidence, analyze the collected data and form reasonable hypotheses based on the analysis of the evidence. Many times, all of the evidence converges and a single, clearly defined origin and cause can be determined. During other investigations, insufficient data is available on which to base a valid origin and cause conclusion. Still other investigations present a more challenging dilemma for fire investigators. In these cases, data is collected that may be unexpected or unanticipated within the context of the scene. Such findings may reasonably allow for diametrically opposed cause determinations. That two opposing conclusions can be drawn from the same data may be anathema to forensic scientists, however Thomas S. Kuhn stated that "Philosophers of science have repeatedly demonstrated that more than one theoretical construction can always be placed upon a given collection of data."¹ For example, the presence of kerosene recovered from fire debris samples may corroborate the hypothesis that an ignitable liquid was deliberately poured in an effort to accelerate flame spread. However, the liquid having been spilled during the filling of a kerosene heater might reasonably explain the same finding of kerosene. Another hypothesis could explain the kerosene as the residue of chemicals endemic to the scene. Additional information will be needed in order to properly evaluate the significance of the kerosene's discovery. Was a kerosene heater present that might support the accidental spill hypothesis? Was the kerosene found only in baseboard wood samples, suggesting that it might be the residue of an insecticide carrier? Does the fire damage match that expected from the fire dynamics of an accelerated fire? The fire investigator must thoroughly evaluate all of the possible explanations before determining the merit of the finding within the context of the incident scene. The key to successfully uncovering the truth in such cases lies in determining whether the unexpected discovery is, in fact, an anomaly or a crucial piece of evidence on which to base a new hypothesis.

Section 15.1 of the National Fire Protection Association's (NFPA) Guide for Fire and Explosion Investigations (NFPA 921) states that "In some instances, a single item, such as an irrefutable article of physical evidence ... can be the basis for a conclusive determination of origin. In most cases, however, no single item is sufficient in itself." When evidence is observed and analyzed, investigators must make a judgment as to the relative significance of that item. What happens to an investigation if an investigator assigns a disproportionate valuation to that single evidentiary item? In the context of a fire origin and cause investigation, the answer to this question could be the difference between the determination of an accidental fire cause and an intentional, incendiary act. In the case study to be presented involving the investigation of a fatal house fire, such an anomalous finding in debris samples taken from the room of fire origin was encountered. The discovery of gasoline in the fire debris samples was the basis for a determination that the fire was incendiary, and consequently, the arrest of a man on capital murder charges. A brief factual synopsis will be presented as the background for a discussion on the weighing and evaluation of a single piece of evidence against the totality of circumstances found at an incident scene. ¹Kuhn, Thomas S. *The structure of scientific revolutions – 3rd ed.* Chicago: University of Chicago Press, 1996.

Crime Scene Investigation, Fire Investigation, Critical Thinking