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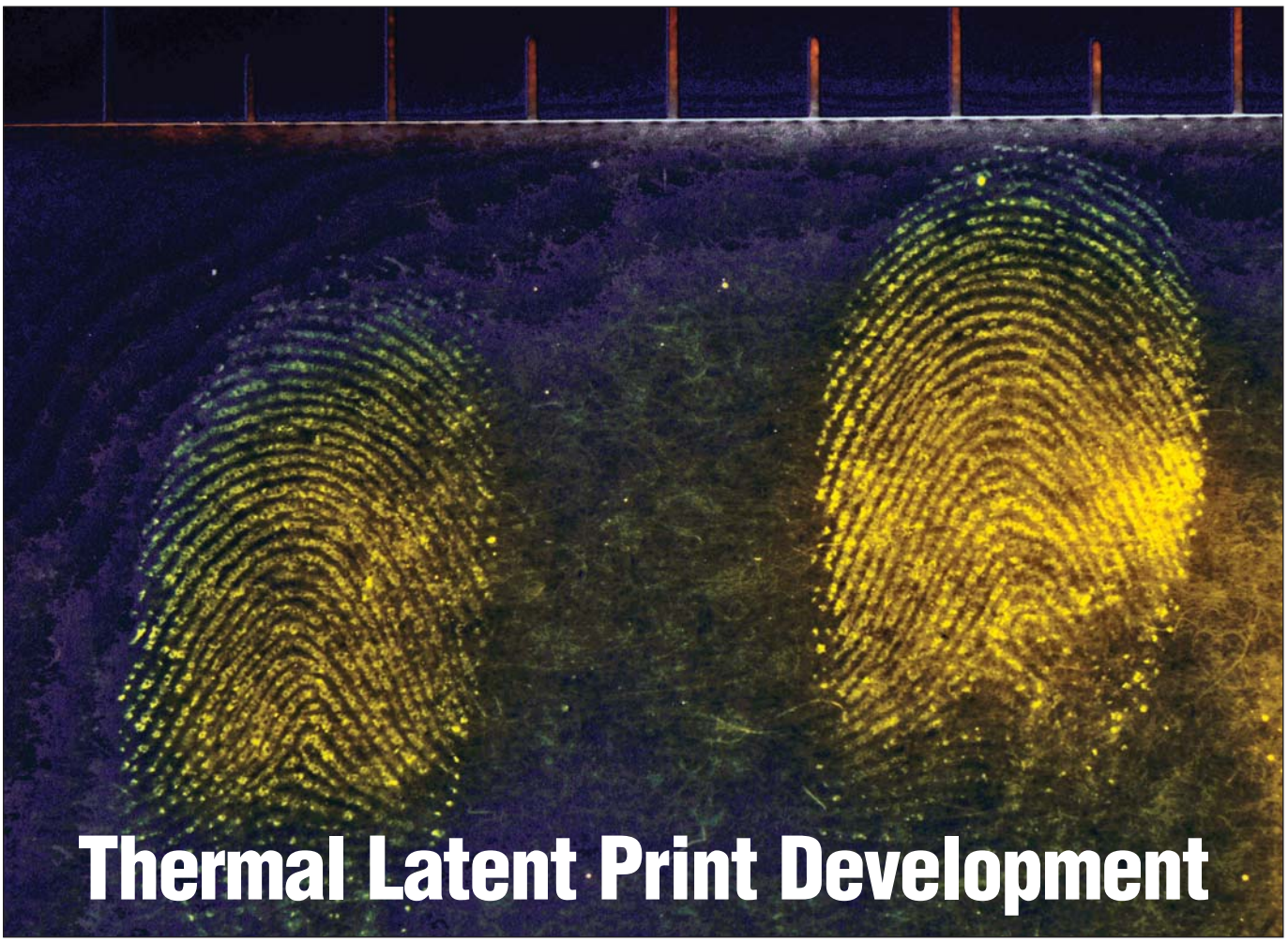


Thermal Latent Print Development

TOPICS IN THIS ISSUE

- Accident Scene Reconstruction
- Effects of Graphical Evidence
- Using the Media in Cold Cases
- Longwave UV Imaging

The Weight of Subjective Conclusions

Written by Michele Triplett

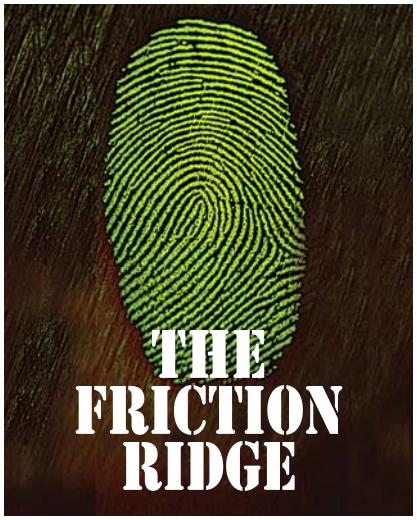
FORENSIC CONCLUSIONS are typically expressed as being "matches" or "identifications". Without statistical probabilities, these conclusions may sound like facts but are more accurately categorized as deductions, inferences, or affiliations. Most forensic conclusions are based on such a wide variety of factors that they are not currently suitable to being represented mathematically. This has led some people to question the value of forensic conclusions, holding that the conclusions are merely the analyst's personal beliefs and not solid scientific conclusions. Is this a valid concern?

The answer may lie in understanding the benefits and limitations behind different types of statistical probabilities. There are three basic types of statistical probabilities. These are known as classical, empirical, and subjective probabilities.

Classical probabilities are commonly used when there are a finite number of equally probable events, such as when tossing a coin. When tossing a coin, the probability of the outcome, either heads or tails, is one-half or 50 percent (one chosen outcome divided by the possible number of outcomes).

There are times when classical probabilities do not accurately represent the probability of an event happening, either because there are infinite possible outcomes or because the likelihood of the outcomes are unequal. In these situations, *empirical probabilities* are used to estimate the possibility of the event.

When using empirical probabilities, the frequency of an event is estimated by observing a sample group rather than considering the possible number of outcomes. As an example, consider the probability of it raining in Texas. The classical probability would consider the possible outcomes (*rain* or *no rain*), and state there is a one-half, or 50 percent, chance of rain. This is clearly inaccurate because the likelihood of each happening is not the same. The probability would be more accurately estimated by examining a sample group of the number of days it has rained in



the past year. Obviously, examining probabilities in this manner may still overlook other important information.

Certain situations are better represented by allowing the user to determine the probability of an event based on knowledge not considered in a mathematical equation. These are known as *subjective probabilities*. Accurately diagnosing a skin rash may involve analyzing the appearance of the rash, additional symptoms, recent exposures, the person's occupation, and past occurrences of similar rashes. A doctor may diagnose a rash based on all of these factors without formally associating numerical weights with each factor. This is acceptable and highly valued if used properly and in the right situation. The value of subjective probabilities is that they can assess more information than currently accounted for in a mathematical equation.

No single type of statistical probability is superior to another. The type of probability preferred is the one that most accurately represents the situation at hand. Numerically based probabilities may sound more persuasive, since there are objective weights associated with each factor, but they can be artificially influential if the weights are inaccurate or if the equation does not account for all relevant information.

Consider the probability of getting an "A" in a class. There are five possible outcomes (i.e., A, B, C, D, and F). The classical probability would say the probability of getting an A is one-fifth, or 20 percent. This would be inaccurate if the likelihood of attaining each grade is not the same.

Empirical probabilities may more accurately represent the situation because the frequency of past grades can be considered. However, one problem with empirical probabilities is that past events may not represent future events unless all factors are similar. Suppose someone had good grades in the past but currently is not motivated to study. In this case, an empirical probability may not accurately represent the current situation.

Instead, subjective probabilities may be able to account for additional factors that cannot be considered with classical or empirical probabilities, allowing for the best representation of the information. One concern associated with subjective probabilities is that a person may base his probability on a gut feeling, a guess, or on intuition, rather than on current relevant information. A common example is when a person gives a subjective probability of the Yankees winning their division. The person is typically basing this probability on personal beliefs and desires, resulting in a personal opinion instead of a sound conclusion.

Those trained in science understand the need to refrain from relying on personal feelings; instead only relying on information that can be demonstrated to others. Stating a subjective probability of the Yankees winning their division based on relevant information, such as the number of injured players, would result in a valued logical deduction.

The value of forensic conclusions is not in their ability to be numerically quantified but rather in the soundness behind the conclusion. In certain situations, subjective probabilities may give the most accurate representation of the information at hand.

About the Author

Michele Triplett is the Latent Print Operation's Manager for the King County Regional AFIS Identification Program in Seattle, Washington. She has worked for the program for the past 20 years.