

THE INVINCIBLE FINGERPRINT: UNDERSTANDING THE BASICS, DEFEATING THE MYTHS

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Abstract

Fingerprint practitioners have historically been hired by law enforcement to aid the prosecution with convictions. Defense attorneys have had little access to essential information. Even with the ability to interview fingerprint practitioners, information has been limited due to the adversarial relationship between the prosecution and the defense. Attorneys must understand basic information about the evidence in a case before they can assess its relevance and weight. This presentation will discuss how fingerprints are formed, how latent impressions are deposited, how images are compared and how conclusions are arrived at. Common misconceptions will be discussed which will give attorneys the knowledge needed to evaluate the weight of the evidence and the expertise of the practitioner. This information can be applied to all pattern evidence practitioners and conclusions.

Friction Skin Formation

Fingerprints are the generic term for all friction ridge impressions. Friction skin is found on the hands and feet of human beings and other primates. Friction skin is a combination of raised portions of skin, known as ridges, and un-raised portions, known as furrows. In humans, friction skin is formed during the 10th – 24th weeks of gestation. With the exception of scarring, once formed, friction skin remains the same until death and decomposition. During the fetal formation of friction skin, pressures during growth determine the final arrangement of friction ridge details. These pressures are from volar pads, which have a genetic influence, the amniotic sac, the mother's body pressing on the fetus and other gravitational forces. Because these pressures cannot be duplicated, friction ridge arrangements have been *established* to be unique.

Volar pads are pads under the skin which vary in location, shape, size and regression. They create surface stresses and tensions and influence resulting friction ridge patterns. The patterns or ridge flow produced during formation are known as level 1 details. There are 3 categories of patterns; arches, loops and whorls. The specific ridge paths are known as level 2 details. These include ending ridges, bifurcations, and dots. Level 3 details include ridge edges, the shape of ridges, ridge width and pores. Friction skin can be more discriminating than DNA. The DNA of identical twins cannot be distinguished from one another while the fingerprints of identical twins are easily discernible.

Residue on the Skin

Pores, openings on the ridges, excrete eccrine sweat. Eccrine sweat is composed of roughly 98% water. The other 2% is amino acids, sodium chloride and trace amounts of other organic and inorganic elements. Sweat and other residues on the skin may be transferred to an item when an item is touched, leaving an impression of the ridge characteristics behind. The presence of an impression established that a person either touched an item or the impression may have been deposited by the transfer of the impression from another object. Transferred impressions leave an impression that is reversed in position from an impression deposited by touching an item. The orientation of an impression may indicate how an item was touched or held.

Types of Prints / Processing

Impressions unintentionally deposited on items when an item is touched are broken down into three basic categories; plastic prints, patent prints and latent prints. Plastic prints are molded into an object. This occurs when the item is soft and pliable. Patent prints are impressions that are visible without processing, such as prints left in dust. Latent prints are usually invisible and need processing in order to be visualized. Development techniques generally include powders and/or chemicals. Factors considered prior to processing include the surface of item (non-porous or porous), the type of residue left on item (sweat, oil, blood), environmental conditions (whether the item was found in water), and the size and condition of the item.

Comparing Impressions

Fingerprints have been used for identification for over 100 years. Prints can either be directly compared to a known exemplar or searched through a database for possible candidates (AFIS or Henry file). ACE-V (Analysis, Comparison, Evaluation, and Verification) is a general description of the visual comparison process. The steps in the process can be described as, 1) Analyze the latent print: the area of the skin it originated from, the levels of detail present and any distortional aspects 2) Compare the features between the latent and the known print 3) Evaluate the data and arrive at a conclusion 4) Verify the conclusion (and perhaps the supporting data). The specific rules used within each step of the process may be different for each agency and must be asked of each examiner on a case by case basis. Data considered in an examination includes level 1 detail, level 2 details, level 3 details, the quality or clarity of the data, the quantity of information, the rarity or frequency rate of each piece of data, the consistency of the intervening ridges between features and any dissimilar features. Relying solely on a point count would discount a large amount of information and is not recommended as a reliable means of establishing an identification.

The Weight of Fingerprint Evidence

Fingerprint evidence is fairly solid evidence but it is not perfect. Approximately 50 errors have been identified to date, worldwide in the past 100 years. Brandon Mayfield (2004) was erroneously identified by the FBI as leaving a fingerprint on a bag of bomb detonators at a Madrid bombing. Dwight Gomas (2009) spent 17 months in jail in New York due to an erroneous fingerprint identification. The error was found by another examiner right before the trial. Argenis J. Burgos (2008), a juvenile in Hartford, Connecticut, spent more than a year in jail due to a fingerprint error. The error appears to

have been that the latent lift card was filled out inaccurately and may have been for a different case. The identification erroneously placed him at the scene of a crime. Past errors can be grouped into three categories; poor documentation, inaccurate and non-tested assumptions and/or relying on subjective characteristics. If there are concerns over the fingerprint evidence and conclusions then an attorney should consider hiring another expert to review the analysis and the conclusion.

Myths

Myth 1: A lack of fingerprints implies a person did not touch an item.

Fact: A person can touch an item and not leave any identifiable fingerprints.

Myth 2: A lack of fingerprints implies an item was cleaned.

Fact: The determination that an item was cleaned must be based on direct evidence, such as wipe marks, not on a lack of other evidence.

Myth 3: AFIS computers make the identifications.

Fact: If the threshold is set high enough, computers can accurately make identifications.

At this time, computer identifications are being performed with high quality tenprint identifications (known to known impressions). This is referred to as “Lights Out”. Latent prints can be searched in database for potential candidates; however, a human being conducts the final examination and determines the conclusion.

Myth 4: Conclusions are Absolutely Conclusive.

Fact: Fingerprint evidence is very reliable but errors have been made. If there are genuine concerns about a conclusion, the conclusion and the support behind it should be checked.

Fact: “100% Certainty” is a measurement of a person’s confidence in the conclusion, not a measurement of the accuracy of the conclusion. In many of the past errors, the practitioner was 100% certain yet 100% wrong. The accuracy of the conclusion is in the data, not the practitioner’s abilities or confidence level. “Training and experience” are not accurate measures of reliable conclusions.

Myth 5: A specific number of features should be used to arrive at a conclusion.

Fact: Unlike DNA, features within a fingerprint do not happen at a constant rate, making it virtually impossible to establish a frequency distribution. This was originally stated in 1973 Ne’urim decision, supported in the NAS Report and reaffirmed in 2010 by the IAI Standardization II Committee.

Fact: A large amount of features does not prevent an error. The clarity and rarity of the features is vital.

Myth 6: Fingerprints are the most positive form of identification.

Fact: All epithelial skin is equally unique (retina, iris, lips, etc.). Fingerprints are collected more often from crime scenes because they are deposited at crime scenes more often.

Myth 7: You can age a latent print (i.e., determine if a latent print was deposited recently, ‘fresh prints’).

Fact: A time frame of when a latent print was deposited cannot be established merely by looking at a fingerprint. Oily prints may appear fresh for years. Non-oily prints may appear faint immediately after they are deposited. The darkness does not establish the age of an impression.

Myth 8: The reason latent prints were not found is because they are 98-99% water and evaporate quickly.

Fact: Eccrine sweat is 98-99% water. Eccrine sweat is from the pores on the hands but latent prints are not necessarily made from eccrine sweat. Latent prints can be from any substance transferred from the hands to an object (sweat, lotion, hair products, food remains, etc.). Latent prints have been developed years after they were deposited.

Myth 9: Overlays are a good way of checking a conclusion.

Fact: Skin is flexible. Overlaying images will NOT result in an exact match.

Myth 10: The 2009 NAS report shows a shift in acceptance of fingerprint evidence.

Fact: The 2009 NAS report was a report to Congress regarding a consideration for future funding. The NAS report stated improvements in forensics were needed.

Myth 11: Wearing gloves will prevent leaving fingerprints.

Fact: Wearing snug fitting latex gloves acts as another layer of skin and a very clear fingerprints can be deposited while wearing them.

Myth 12: The error rate of fingerprints comparisons (or the ACE-V process) is zero.

Fact: No research has ever indicated that the error rate is zero. No research has shown any specific protocols behind the ACE-V process or indicated that the practitioners followed any specific method.

Defenses Against Fingerprint Evidence

A fingerprint identified on an object does not indicate guilt or innocence by itself because there are legitimate reasons fingerprints are found at the scene of a crime. The subject may have had legitimate access to an area or item. The subject may have touched the item prior to the crime, the time a print was deposited cannot be visually determined. Other issues that should be considered include, the evidence may not have complied with proper procedures (to seize an item), the latent print matches a card on file but has that card been linked to the defendant?

Common Challenges

Common challenges include:

- A lack of standards, research and validation

Attorneys should ask for the standards for each type of possible conclusion. Where are the standards published? Many practitioners may be testifying to their personal opinions but making them sound like scientific conclusions.

- No probability studies on frequency distributions
- No statistical likelihood ratio's, like DNA
- Too much human interpretation (subjectivity)
- Bias is not accounted for
- ACE-V has not been validated
- Error rates are unknown, this conclusion may be wrong

If a pattern evidence expert cannot show you supporting data behind a conclusion, have the analysis and the conclusion reviewed.

- The credibility of the expert may be questionable

Attorneys should thoroughly review an expert curriculum vitae (CV). The items on the CV should be verified. Some practitioners have overstated credentials in the past. The expertise of a witness is just as important as the evidence itself.

- Opposing conclusions may exist

Each agency should be able to state how conflicting and opposing conclusions are handled and documented. How would someone know if anyone disagreed with a conclusion in any specific case?

- Additional latent prints may exist that indicate another scenario.

Attorneys should review the evidence including latent print cards for additional latent print impressions. Fingerprint impressions are easily seen by layman and this extra quality assurance measure takes only a few minutes.

- Fabrication of fingerprint evidence

More cases of fabrication have been documented than unintentional errors. Although fabrication would not seem likely, it should be considered.

Warning Signs in an Expert's Ability

There are some basic qualifications that all forensic practitioners should possess. Practitioners should be able to show when and how they were qualified as an expert by their own discipline. In addition, they should be able to show continuing education and proficiency testing. Practitioners should be able to demonstrate to layman the information that led them to the conclusion.

The words practitioners use may indicate their level of expertise. Phrases such as 100% certain, absolute conclusions, zero error rate, or turning a discussion about accuracy into a conversation about confidence and changing a conversation about validity into a conversation about reproducibility of the conclusion may be warning signs. Overstatements and answering a different question than was asked should be examined further.

One of the easiest warning signs is an expert who puts weight in themselves over putting weight in the data; such as placing weight in their training, experience or notoriety instead of ensuring the weight of the conclusion is due to overwhelming data. Training and experience are factors of ability but not factors of accuracy. Membership in professional organizations shows a person has paid dues but it does not indicate levels of involvement or competency.

Conclusions

Fingerprints, as well as other forensic evidence, are valuable forms of information; however, accuracy should never be assumed or taken for granted. If there is a reason to doubt the evidence then questions should be asked. A true expert will appreciate the questions and take them as an opportunity to clarify information.