# Appendix 2 to the textbook
# Court Presentation of Fingerprint Evidence
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## Model Brief to Support Latent Print Identification

The following was prepared to assist council tasked with defending fingerprint evidence in evidence hearings, such as a Daubert hearing. To assist you in legal arguments, feel free to use it and modify as needed in preparing oral or written responses to challenges. I have written responses on topics that have been used in challenges in the past. There is no need to credit the information used, unless it is being used in a publication outside of the legal system. Permission is given to download and cut and paste into legal responses to challenges to fingerprint evidence.

For the fingerprint examiner, this information will also assist them in responding to these issues while testifying. Much of this information can also be used when addressing community groups as to the rich history of fingerprint identification.

**Background**

Friction skin identification is one of the oldest forensic sciences. It was first suggested as a scientific means of criminal identification in1880, by Dr. Henry Faulds, a medical doctor, who was researching friction ridge skin at his medical school in Japan. Some of the earliest peer review articles were written by Faulds and published in the British Scientific journal, *Nature*.

The first court acceptance of fingerprint identification occurred in India, while a British possession under British Common Law. This occurred in the late 1800's. Since that time fingerprint identification has been tested in the courts of the World and has been universally accepted and in use for over 100 years.

In the United States, the first appellate court ruling affirming friction ridge evidence occurred in ***People v. Jennings***, 252 Ill. 534, 96 N.E. 1077 (1911) where the Court stated that: “There is a scientific basis for the system of finger-print identification, and that the courts are justified in admitting this class of evidence;

that this method of identification is in such general and common use that the courts cannot refuse to take judicial notice of it..."

Since that time all state and federal courts have admitted friction skin evidence. Every federal, state, and local law enforcement agency in the United States recognizes and uses latent print evidence as a positive means of criminal identification.

In 1941, in ***Grice v. State***, 142 Tex. Crim. 4, 151 S.W. 2 211 (1941) the Court stated: "It has occurred to us that instead of the state being called upon to offer proof that no two finger prints are alike, it may now be considered in order for those taking the opposite view to assume the burden of proving their position." To this day, the opposing view has not met that burden.

In ***United States v. Magee***, 261 F2d 609, 612 (7 Cir. 1958) the Court stated: "Obviously there can be no more reliable evidence of the identity of a defendant than his own fingerprints."

These cases involved the identification of partial latent print evidence found at crime scenes.

With over 100 years of practical application in the use of partial latent print evidence to provide positive identification, coupled with over 100 years of judicial acceptance in the courts of the United States and the world, the empirical foundation of this scientific form of evidence is firmly established.

**Scientific Foundation**

The scientific and medical research that establishes all areas of friction ridge skin as permanent and unique can be found in the biological sciences and the study of human anatomy. This research has taken place over the last three hundred years and this scientific foundation continues to be reinforced today.

There is a fundamental Law of Nature called Biological Variation. This well-known law states that all things created in nature will be unique. The fact that this Natural Law applies to friction skin formations (fingerprints) has been documented in a number of scientific reference books on friction ridge identification including the following works:

*Personal Identification* (1918) P. 325, by Dr. Harris Wilder, Professor of Zoology at Smith College,
*Finger Prints, Palms, and Soles, An Introduction to Dermatoglyphics* (1961), PP. 150-151, by Doctors Harold Cummins and Charles Midlo, Professors of Anatomy at Tulane University's Medical School,

*Hands* (1980) P. 142, by Dr. John Napier, MD, Professor of Primate Biology at the University of London.

Vanderkolk, John R. (2009) *Forensic Comparative Science*, pp. 37-38, Elsevier Academic Press

The application of this law to fingerprints is most simply demonstrated by the fact that even "identical twins", do not have identical fingerprints. This fact has been proven in a number of studies of the fingerprints of twins. Some of these studies are published in the above references. Fingerprint examiners are able to tell the difference between identical twins by comparing just small areas of their fingerprints.

Scientific and medical research into the formation of friction skin has demonstrated that the fundamental Law of Nature, Biological Variation, applies to friction skin. Friction ridge skin, also known as volar skin is present on the fingers, palms, toes, and soles.

The first medical book addressing the uniqueness of fingerprints was written by Dr. J.C.A. Meyer of Germany in 1788 and was titled, *Anatomical Copper-plates with Appropriate Explanations*. Since that time, all scientists and medical doctors who have researched the formation of the friction ridges during fetal development have concluded that all areas of friction skin are unique and the formation of the details of the ridges are persistent or permanent. This research has been published in a number of books, and in medical and scientific journals. All have undergone extensive peer review.

A sampling of the works includes:

The journal article, On the Skin - Furrows of the Hand, 1880, by Dr. Henry Faulds, M.D., appeared in the scientific publication, *Nature*. The article included

his research into the permanence and uniqueness of fingerprints and the observation that prints found at crime scenes could lead to the scientific solution of crimes.

The first book published on fingerprints, *Finger Prints*, was written by Sir Francis Galton, and published in 1892. Galton was a research scientist studying human genetics and trained in mathematical probabilities. This work included the first statistical study supporting the uniqueness of fingerprint identification. The study showed that the chance duplicate of a single partial fingerprint was one in sixty-four billion. This study was reviewed in 1995 in the publication, Genetics, and found to still be valid, but overly conservative.

The research paper, *The Ventral Surface of the Mammalian Chiridium*, 1904, by Professor Inez Whipple, PhD., of Smith College, explained how friction ridge skin is formed and provided a biological foundation for all future research into the formation of friction ridge skin.

The reference book, *Personal Identification*, 1918, By Professor of Zoology Harris Wilder, PhD and Bert Wentworth, discussed why all areas of friction skin are unique, not just entire fingerprints. Based on their research, they stated that the individual ridges possess uniqueness allowing the identification of partial prints. Their statistical study demonstrated that the chance of a small area of friction skin, that contains only nine (9) characteristics being duplicated on another area of friction skin, is one in one quadrillion, nine hundred & fifty-three trillion, one hundred & twenty-five billion.

The textbook, *Finger Prints, Palms, and Soles, An Introduction to Dermatoglyphics*, 1943, by Professors of Human Anatomy Harold Cummins, M.D, and Charles Midlo, PhD of Tulane University School of Medicine, describes in detail how friction skin in formed during fetal development and how all areas, not just entire prints are unique. From the 1940's through the 1960's the professors lectured to law enforcement groups, including the International Association for Identification on how to use this knowledge to identify partial prints found at crime scenes to criminal suspects. They also published statistical studies that reinforced the uniqueness of all areas of friction skin.

The research paper, *Morphogenesis of the Volar Skin in the Human Fetus*, 1952, by Dr. Alfred Hale of Tulane University, explains how differential growth causes all areas of friction skin to form unique formations.

The research paper, *Dermal and Epidermal Structures of the Volar Skin*, 1976, by Dr. Michio Okajima of Japan, reinforces all previous studies explaining why all areas of friction skin are unique.

A series of research papers, including *Embryological Development of Epidermal Ridges and Their Configurations*, 1991, were written by Dr. William Babler, DDS, PhD. Dr. Babler also testified at the first Daubert hearing on fingerprints and stated that not only are all areas of friction skin unique, but that each individual ridge is unique. ***United States v. Bryon Mitchell,*** [365 F 3.d 215 (3 Cir. 2004), cert denied 125 S.Ct. 446 (2004)].

Henry J. Swofford, of the United States Army Crime Lab, in conjunction the Biology Department of Georgia State University published his review of the scientific research that provides the biological explanation for why friction ridges are unique and provides the basis for personal identification. His paper; *The Ontogeny of the Friction Ridge: A Unified Explanation of Epidermal Ridge Development with Descriptive Detail of Individuality*, was published in the *Journal of Forensic Identification*, Vol 58, No 6, Nov/Dec 2008. Swofford points out in his review that "the uniqueness and permanence of friction ridges throughout postnatal life, has been unanimously supported by all biological and anatomical researchers".

The extensive research that establishes all areas of friction skin as unique and permanent has occurred over hundreds of years and is now supported by over 100 years of empirical proof through the constant, daily use of fingerprints to establish the identity of persons and to identify criminals using partial latent prints found at crime scenes.

Fingerprint identification enjoys an extensive foundation of scientific research and testing. Additional research, as with all scientific endeavors is continuing and as noted by the 4th Circuit Court of Appeals, "— Further research would be welcome, but meanwhile, to bar use of this bedrock forensic identifier is unwarranted. Cross-examination can test foundation and reliability of testimony

from fingerprint experts." ***United States v. Crisp***, 324 F 3d 261, (4th Cir), cert. denied, 124 S. Ct. 220 (2003).

In summation, the doctrine that all areas of friction skin are unique, provides the basis for fingerprint identification, and establishes the fact that partial latent prints found on surfaces can be identified positively to individuals, is founded in three areas:

1. The fundamental Law of Nature, (**Biological Variation**).

2. The extensive scientific and medical research that confirms all areas of friction skin are unique, (**Scientific Validation**).

3. The over one hundred years of practical application of this knowledge, (**Empirical Knowledge and Validation**).

**Reliability**

Fingerprint identification has been used as the primary means of personal identification throughout the world for over 100 years. In the United States, all branches of the military, all federal government investigative agencies, the Federal government itself, all state and local governments and law enforcement agencies exclusively use fingerprints as the only positive form of personal identification. Also, the use of partial latent prints found at crime scenes for criminal investigation is and has been accepted in every country of the world, and all federal, state, and local law enforcement agencies of the United States for over 100 years.

All of the major countries of the world and many of the smaller ones have invested in automated fingerprint identification systems (AFIS). These systems are used to establish identity, track criminal records, and to search partial prints found at crime scenes to identify suspects. According to Interpol (2204) between ten to fifteen percent of the world population's fingerprints are now stored and searched in automated fingerprint identification systems. Today, it is estimated that over twenty percent of the world's population fingerprints are in AFIS. Many of these systems are now networked. In addition to being the most common form of physical evidence and the only universally accepted form of positive personal

identification, fingerprint identification is also a multi-billion dollar biometric industry.

The United States Government and our military have such confidence in the reliability of fingerprints as a positive form of identification that access to top security areas and other secret information is protected using fingerprint recognition systems. These systems, for the most part rely on single fingerprints and usually make the identification on partial impressions.

Our courts and criminal justice system also have demonstrated the reliability and their collective confidence in fingerprint identification. All criminal record "rap sheet" entries are verified by fingerprints prior to arrest and conviction information being added to a person's criminal history. Once again, although all ten fingerprints are submitted, the actual identification is usually made using a single print. The courts also rely on fingerprint identification to prove prior criminal history for sentence enhancements in three strikes and other career criminal statutes.

The fact that fingerprint computer systems can duplicate the identification process done by latent print examiners with amazing accuracy demonstrates how objective and reliable the fingerprint identification process is. The reliability of fingerprint identification has been well established. If there was an issue with the reliability of fingerprint identification it would have been discovered long ago.

**Error Rates**

Error rates can be of two types. The first type is applied to the discipline of friction skin identification itself. The fact that all areas of friction skin are unique, and the details are permanent, allows fingerprint examiners to state that the error rate for the science of fingerprint identification is zero. What that means is that the chance of a duplicate area of friction skin appearing on another area of friction skin or on another person is non-existent. This fact has been proven by the medical and scientific research that has taken place, the empirical proof offered by hundreds of years of observation and use, along with the natural law that all things created in Nature are unique. Because there is no chance of a duplicate area of friction skin on two different persons or even different areas of friction skin, fingerprint examiners state that the error rate for the science of fingerprints is zero.

The second type of error rate can be applied to the individual examiner. The error rate for the individual examiner although perhaps impossible to determine is quite low. As noted in a number of court rulings, this error rate is "vanishingly small", ***United States v. Havvard***, 117 F. Supp. 2d 848, 854 (S.D. Ind. 2000), aff'd 260 F. 3d 597 (7 Cir. 2001), "negligible", ***United States v. Crisp***, 324 F 3d 261, 269 (4 Cir. 2003), and "microscopic", ***United States v. Mitchell***, 365 F.3d 241.

The fact that fingerprint identifications are subjected to verification as a quality control process mitigates any subjectivity and identifies errors during the comparison process.

The argument that fingerprint examiners cannot reliably identify partial prints flies in the face of an established unprecedented track record of success. This argument also goes to the weight of the evidence rather than the admissibility as noted by the 7th Circuit Court of Appeals, "As to the defendant's complaint that identification was unreliable because it is based on partial prints, issue of whether prints match is best left to the trier of fact.", ***United States v. George***, 363 F.3d 666 (7 Cir. 2004).

See the chapter on Testifying to Error Rates for additional information and studies.

**Infallibility**

The defense bar and critics of fingerprint identification argue erroneously stated that latent print examiners say that they are infallible. These critics confuse the factual statement that the error rate for the underlying science that establishes all areas of friction skin are permanent and unique as zero with the infallibility of latent print examiners. Fingerprint examination is done by human beings and all human beings can and do make errors. The first area of forensic science to use the redundant process of verification was fingerprint identification. This was done to minimize the chance of errors in fingerprint identification. If fingerprint identification process was infallible, verification would not be necessary.

No court has a standard of perfection to be admissible. The 9th Circuit Court of Appeals acknowledged this while ruling that "handwriting analysis need not be flawless in order to be admissible. Rather, the Court had in mind a flexible inquiry focused "solely on principles and methodology, not on the conclusions

that they generate." Daubert, 509 U.S. at 595. As long as the process is generally reliable, any errors can be brought to the attention of the jury through cross-examination and the testimony of other experts", ***United States v. Prime***, 363 F. 3d 1028 (9th Cir. Wash., 2004).

## Testing and Validation

It is suggested by some academics and adversaries of fingerprint identification that the only "testing" that has taken place is the scientific studies that show all areas of friction skin are unique and permanent. This is not true. They chose to ignore that all latent print examiners' abilities are tested in training programs and classes that they attend and by their agencies to ensure that their fingerprint examiners are competent and can accurately do their job.

Most major law enforcement agencies and all accredited crime labs require that their fingerprint examiners go through competency testing to demonstrate a level of competence at the end of initial training and annual proficiency testing to demonstrate the continued ability to individualize fingerprint evidence. These tests are made up using partial prints from known sources. The ability of fingerprint examiners to reliably identify partial latent prints is constantly tested.

## ACE/V Methodology

The steps or methods used in the identification process is described using the acronym ACE/V, which stands for Analysis, Comparison, Evaluation, and Verification. During the analysis phase, the prints being compared are analyzed to determine what detail is available for comparison, the quality of that detail, and the area of friction skin which may have made the impression. During the comparison phase, the unknown print and the exemplar print are placed side by side under magnification and compared. The evaluation phase takes place during the comparison. The ridge details are evaluated to determine if they are the same or in agreement or if they are different. When the detail is in agreement, an identification is made. If the detail is different, the unknown print is eliminated as having been made by the donor of the exemplar prints.

Identifications and sometimes eliminations are subjected to an independent verification by a second and in some departments by a third examiner. This is done as a quality control to catch errors.

The amount of detail needed to make an identification will vary from print to print and depends on the quality and quantity of the detail available for comparison. Fingerprint examiners exercise their professional judgement as experts to

determine at what point to make an identification, subject to independent verification. "[T]he fact that some professional judgment and experience is required also does not mean that expert testimony is inadmissible. It is instead the hallmark of expert testimony, so long as it can otherwise meet the standards of reliability set forth in Daubert and Kumho Tire." ***United States v. Wade Havvard***, 117 F.Supp.2d 848 (D.C.Ind. 2000).

The manner in which fingerprints are compared has changed very little in the last one hundred years. The ACE/V terminology has been used and has gained wide spread acceptance among latent print examiners during the last thirty years. ACE/V has provided latent print examiners with a standardized language for describing the identification/individualization process (Scientific Working Group on Friction Ridge Analysis, Study, and Technology, Friction Ridge Examination Methodology for Latent Print Examiners, ver. 1.01, available at www.swgfast.org). ACE/V has been recognized by the courts as the methodology used by latent print examiners during the identification process, ***Commonwealth v. Patterson***, 445 Mass. 626; 840 N.E. 2d 12 (2005).

**Blind Verification**

Fingerprint identification was one of the first, if not the first field of forensic science to institute verification as part of the identification process. Verification of latent print identifications is not a legal requirement and never has been. Verification is a self-imposed requirement used by most latent print examiners and agencies. Verification has been done in many agencies for at least the last fifty years. Verification was not instituted to make the identification process more scientific. Verification was instituted to check for errors. Latent print examiners have long understood the importance of accuracy and the ramifications of identification errors. To help ensure the quality of latent print identifications, verification was instituted. As noted in other sections of this brief, courts have already taken notice of the low error rate for friction ridge identification. Identification errors as serious as they are, are not even statistically noticeable. Identification errors that have been verified are almost non-existent.

The argument that blind verification can eliminate bias during the examination may be true. However, bias during friction ridge examinations has not been

established as a problem by any empirical study, so imposing blind verification solves a problem that has not even been proven to exist.

The New Hampshire Supreme Court has acknowledged this; — "[F]ederal courts have [also] found ACE-V to be reliable under Daubert, while noting that verification in the ACE-V may not be blinded." ***United States v. Mahone***, 453 F.3d 68, 72 (1st Cir. 2006) (citations omitted). While we acknowledge that a small number of misidentification cases using ACE-V methodology do exist, it is undisputed that ACE-V methodology has been reliably applied in countless cases without the use of blind verification. Further, as the testimony of Starrs and Ostrowski demonstrates, the fingerprint community is currently debating whether blind verification actually leads to more accurate results. To be sure, while blind verification may ensure with a higher level of certainty that an identification is correct, the record contains no indication that non-blind verification is unreliable." ***New Hampshire v. Richard Langill***, 157 N.H. 77, 945 A 2d 1 (2008).

Requiring blind verification would negatively impact the workload of latent print examiners, without any proof of necessity. Once again, verification is not a legal requirement. Latent print examiners testify to their analysis, not the collective opinion of their colleagues who may have verified their work. The proper place to challenge an expert's conclusions and opinions is through cross examination and the presentation of other experts with opposing opinions.

**Documentation During Analysis**

It has been suggested that without extensive contemporaneous bench notes during the analysis, comparison, and evaluation stages of the identification process, others, including any opposing legal counsel or other latent print examiners cannot determine if the process was reliably done. As noted by the American Society of Crime Lab Directors, Laboratory Accreditation Board, the accreditation agency for forensic labs, "notes, drawings, diagrams, and narrative descriptions alone are not sufficient to support the conclusions of a latent print examination. The original print or a copy of the print suitable for comparison must be retained." ASCLD/LAB Manual, pp 32-33, 2005.

In addition to making notes as to the area of friction skin identified and to what exemplar it matches, fingerprint examiners maintain the best evidence – the prints

themselves that were compared. The prints are available for review by anyone qualified to determine if the analysis was done correctly.

In some other areas of forensic science, during the analysis, the evidence samples can change, be used up, or be destroyed. The importance of contemporaneous notes as to what was done and observed, such as reactions, temporary color changes, or other observations are needed to preserve the evidence or to justify the conclusions or opinions that are reached. This is not the case with friction skin evidence as the only way to review the analysis is through re-analysis, which is always available to the opposing counsel's experts.

**Friction Skin Identification is Not Subjective**

Subjective is defined as being "Based on an individual's perceptions, feelings, or intentions, as opposed to externally verifiable phenomena", Black's Law Dictionary, 8 Edition. Friction ridge identification is an objective process based on a comparison examination of the unique ridge formations of friction skin impressions. The examiner uses skills acquired through training and experience, and the results of the examination are subjected to verification. The conclusions can be supported and demonstrated to other examiners, and the basis for the conclusions can be explained to courts and juries. This is why friction skin identification has withstood the test of time in the judicial systems of not only the United States, but the world.

As noted by the 7th Circuit Court of Appeals, "Results are objective, capable of testing, and have a low error rate. Method has been subjected to "peer review" via adversary system for 100 years", ***United States v. Havvard***, 260 F.3d 597 (7 Cir. 2001).

**DNA Profiling v. Friction Ridge Identification**

It is well established by hundreds of years of scientific research and through the overwhelming evidence of over one hundred years of practical application that each fingerprint including small areas of friction ridge skin are unique to each individual. DNA analysis differs from fingerprint identification in that fingerprint examiners do a direct comparison of the unique arrangement of the details of the print, whereas DNA profiling relies on a comparison of profiles created from class features that are not unique. Once again, rather than doing a direct

comparison of unique features as is done with friction ridge skin, DNA creates a "profile" based on class characteristics or features, that repeat. Based on how many loci match and their locations with the known markers, a statistical analysis is done to determine how often the combination of loci could be found in a population, creating a statistical DNA profile.

Because DNA profiles contain class characteristics only, population studies must be done to determine how often each of these markers occur in a population and as more markers are in agreement, the statistical odds are multiplied. A DNA profile could be compared to a study to determine how often fingerprint patterns would appear on each of the ten fingers within a population. A statistical probability could be calculated that could then predict how often two people would have the same patterns on all ten fingers. The overall fingerprint patterns are class characteristics. However, this study could not be used to "individualize" any fingerprint.

The features that are compared to identify fingerprints are the unique arrangement and appearance of the individual ridges of the fingerprints. These detailed features are the unique individual characteristics of fingerprints and are identified by doing a direct, side by side comparison of the fingerprint impressions. Because unique features are being directly compared, an individualization or elimination will be determined. There is no need for population studies or statistical analysis, because the objects being compared are unique or one of a kind.

This is not to say that there have not been statistical studies to support friction ridge identification. The first statistical study supporting the identification of fingerprints occurred in 1892, by Sir Francis Galton and was published in his treatise, *Finger Prints*. Since that time there have been dozens of studies involving the statistical analysis that demonstrates the randomness of the ridge formations of friction skin. They include, but are not limited to:

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|---|---|
| Galton | 1892 |
| Henry | 1900 |
| Balthazard | 1911 |
| Bose | 1917 |
| Wilder | 1918 |
| Roxburgh | 1933 |
| Cummins & Midlo | 1943 |

| | |
|---|---|
| Amy | 1946 |
| Trauring | 1963 |
| Kingston | 1964 |
| Osterburg | 1980 |
| Stoney | 1989 |
| Champod | 1996 |
| FBI-Lockheed Martin | 1999 |

The one common denominator of all these studies is that they demonstrate that the chance of a duplicate single fingerprint is many times the population of the earth. Most of these studies dealt with single partial prints. None of these studies take into account what is now referred to as third level detail, in other words, the actual appearance of the ridge features, which possesses the most discriminating information within the ridge formations.

For the last thirty plus years, every day, 24 hour a day, a study has been taking place using all the automated fingerprint identification systems (AFIS) around the world. Interpol suggests that on any given day thousands of partial prints are checked against data bases containing many millions of prints. This amounts to billions of comparisons a day. These data bases collectively now include close to fifteen percent of the world's population. Many of these systems are now networked. Despite billions of comparisons a day, each day, for twenty-five years, no two prints have been found to be the same.

As the Interpol European Expert Group on Fingerprint Identification - IEEGFI states on the Interpol website, "The axiom that not two persons have the same fingerprints is already firmly based. With the comparison of billions of prints per day, the opposite is never found, so the uniqueness is constantly confirmed in an unprecedented way." No other form of evidence has ever been subjected to this level of scrutiny.

For more detailed information, see the chapter, Scientific Evidence Supporting the Uniqueness of Fingerprints.