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The Admissibility of Fingerprints as Scientific Evidence in
Courts of Law

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Abstract

The use of fingerprints as a method of personal identification dates back hundreds of years; indeed, their application is common knowledge in many households today. Their origin can be traced back to the Middle East and have been discovered on clay artifacts. There have also been articles and books written on the use of fingerprints as seals on official documents. Thomas Bewick, an engraver and author, used his fingerprints along with his name on many of his works, suggesting that he understood the uniqueness of fingerprints of each person (Cumming & Midlo 1943). The famous author Mark Twain used fingerprints in the book *Pudd'n 'head Wilson*. In his book, Twain used a bloody fingerprint on a murder weapon causing the defense attorney to have the town fingerprinted. During trial, the attorney educates the jury on the permanence of fingerprints and how even twins have different ones (Ashbaugh, 1999).

Fingerprints in fact, have become a major asset as a crime-fighting tool. Their official widespread employment as identifiers dates back to 1902 in the United States. Several articles on fingerprints have been written, most of which are idealistic and pointless; however some do have merit. Nonetheless, in the years to come, it will prove fingerprints are and will be the preferred method of identification in the United States. Hence, it is important for latent print examiners to further their knowledge in the history of fingerprints, their morphological structure, and their scientific use in identification.

Introduction

Recently, fingerprint science has come under the scrutiny of defense lawyers and courts alike who believe there is no proven scientific foundation to validate the identification process. However, the identification of fingerprints is an important tool in crime fighting which often results in the arrest and conviction of offenders. This method of identification is an applied science. It is based on a proven theory that no two individuals have the same fingerprints and that prints are permanent throughout an individual's life.

The purpose of this research paper is to review current court opinions and studies regarding the issue of subjectivity in the identification process. This review will provide documentation that the identification process meets the standards of admissibility as required under *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993). The research will also disclose that identification is not established merely with "points," but rather a four-step process is utilized (Meagher 2001). The subjective nature of the identification is hindered partly by the exclusion of a standard regarding the number of "points" needed to establish the identification.

Multiple information sources were used in this research report. Numerous articles and books have been written on fingerprint issues. Studies have shown fingerprints are unique to every individual and will remain permanent throughout life, barring accidental scarring. Specifically, the ridge structure on an individual's fingers, palms, toes and the soles of the feet begin forming during the third month of fetal life. Experts feel environmental factors such as stress and illness affect the development of the ridge structure. A study of identical twins has supported this theory. Through research, scientists have established that identical twins share the same genetic makeup; however they possess different fingerprints. To gain a better

understanding of the subjective nature of the topic, an interview with a prosecutor and defense lawyer have been conducted to further develop this topic area.

This research is being conducted to assist identification officers of the Galveston County Sheriff's Office who routinely testify in courts of law concerning the identification of fingerprints. The information will provide an understanding of the four steps used in the identification process and the proven scientific standards as set out in *Daubert* (1993). The research will also provide information regarding dermatoglyphics and the genetic structure of ridge structure.

REVIEW OF THE LITERATURE

Throughout the United States, knowledge on the use of fingerprints for identification is as common as the television. When used for a "good cause," such as the identification of an unknown decedent or someone with a mental impairment society advocates its use. However, when used to identify an attacker or offender, skeptics emerge to call into issue the validity of the science and question its use. The premise that fingerprints provide a positive means of identification does, in fact, date back hundreds of years

The history on the use of fingerprints in the United States is an interesting one. Fingerprint use began in 1902 in the United States and it has become an important asset in crime fighting, although it is not without controversy. As recently as January 2002, a federal judge in Philadelphia ruled that the fingerprint evidence presented in his court was inadmissible since it did not meet the scientific standards required in a court of law (*The New York Times* 2002). The legal standard applied falls under *Daubert* (1993). The presiding judge in the case agreed to let the latent print examiner speak about points of comparison and the fact that no two people

have the same prints. However, he refused to let the examiner make or offer an "opinion" on the identification of the crime scene prints.

Examiners fear the judge's ruling on the admissibility of fingerprint evidence would cause other disciplines to suffer. The article indicated that the key issue is the scientific rate of error of the empirical data. To better understanding the issue, *Daubert* (1993) has been examined. In a Texas court of law, all expert testimony must follow the admissibility rules for scientific evidence as set forth in *Daubert* (1993). The standard was articulated and governs the admissibility of scientific evidence in federal and Texas courts; however, many state courts have adopted it rather than utilizing the Frye Rule (Frye v. United States, 293 F.2d.1013 (D.C.Cir 1923)). The Frye Rule resulted from the trial of James Alphonzo Frye, who was convicted of a 1923 murder. The case was appealed to the Court of Appeals of District of Columbia and the following was noted:

While the courts will go a long way in admitting expert testimony, deduced from a well-recognized scientific principle or discovery, the thing from which the deduction is made must be sufficiently established to have gained **general acceptance** in the particular field in which it belongs.

The key issue in the Frye Rule is the term "general acceptance". The *Daubert* (1993) standards exceeds the "general acceptance" rule used in Frye; however, in a *Daubert* (1993) hearing, the judge is still the deciding body on relevance of the evidence and the reliability of the witness providing the testimony.

METHODOLOGY

In a Daubert hearing, four factors must be considered by the court when making its decision on the admissibility of the testimony. The factors are:

- whether the methods upon which the testimony is based are centered upon a testable hypothesis
- whether the method has been subjected to peer review
- whether there is a known potential rate of error associated with the method
- whether the method is generally accepted in the scientific community.

In fingerprint identification, the examiner must gain a broader knowledge of fingerprints and their development. Having been in law enforcement for nineteen years, fifteen of which were spent as a latent print examiner, the author has dealt with and studied fingerprints in preparation for courtroom testimony. During basic fingerprint training, each student is taught the history of fingerprints and its development. Throughout the training, students learn that fingerprints have been used for well over one hundred years, with no two individuals having been found who have identical fingerprints; this itself begins to answer the first factor of *Daubert*(1993).

The use of the word "fingerprint" for our scope of study will refer to the friction skin arrangement rather than its pattern type (Ashbaugh 1999). Studies of fingerprints have shown that pattern types are genetic, but the manner in which the friction skin develop are not. Education of the growth and development of the hands (volar friction ridge skin) during gestation is needed to understand friction ridge skin growth. During the sixth week of fetal development, the hands appear paddle like. At approximately the tenth week, the fingers separate and become distinct digits. Dermatoglyphics, in its simplest form, describes the development of the friction ridge skin. The friction ridge skin is comprised of two skin layers. The outer skin is

referred to as the epidermal layer and the inner layer is called the dermal. The epidermal layer is constructed of cells which, with time, slough off and are replaced by new cells. The dermal papillae of the inner skin are extremely delicate. If one's dermal layer is damaged, permanent damage occurs.

The volar pads first appear about the sixth week of fetal development. In this stage, the hand is paddle-shaped and fragile. At the end of the second month, the digits separate and become independent. The critical stage of this development occurs in the third and fourth month of the development. Even though the ridges aren't elevated on the volar pads until the eighteen week, the epidermis thickens and the papillary modeling of both the epidermis and the dermis are attained. During fetal development, pressure on the fingers modifies the progressive development of the ridge development. This pressure, along with other internal and external factors, alters ridge development; thus, imperfect ridges are formed. Birth itself is a mystical phenomenon and part of the environmental factors affecting the ridge development.

To establish an answer for the factor regarding fingerprints as a science, Mr. Stephen Meagher of the FBI, in a recent court case, (*United States of America v. Byron C. Mitchell* 1999 United States District Court for the Eastern District of Pennsylvania, Criminal No. 96-00407), has responded to the factors required in Daubert

During the trial, Mr. Meagher provided an answer to first requirement: which is whether the methods upon which the testimony is based are centered upon a testable hypothesis. Mr. Meagher's response was to bring the worldwide use of fingerprints into the trial. At trial, Meagher provided a statistical study by Lockheed Martin Corporation, using 50,000 fingerprints. The study was conducted under the direction of the FBI. The fingerprint test focused on left sloped loops of white males only and dealt with only level two detail (ending ridges and

bifurcation's) in the prints. The prints were entered into the Automated Fingerprint Identification Systems (AFIS) of 50 states and Great Britain. The test concluded that the probability rate of any two fingerprints being the same was 1 in 1086 . The report indicated that there are 5.9 billion people in the world's population; therefore, 59 billion fingerprints (5.9 billion x 10 fingers) were represented in the test. This test alone should clarify the frequently asked, "Do two individuals have identical fingerprint?"

A step beyond the statistical study is the information that has been gathered over the years regarding twins. Many studies in the development of monozygotic (identical twins, occurring when one egg is fertilized by one sperm) and dizygotic twins (fraternal, occurring when two eggs are fertilized by two sperm) have been conducted and validate Meagher's test. The fact that monozygotic twins are developed from one egg and sperm would lead to the belief that their friction ridge skin (fingerprints) would be the same. However, no two twins have been found with identical fingerprints (level two detail).

In response to the second Daubert factor: which is whether the method has been subjected to peer review. Peer review occurs during the verification process of the examination, which is the last step in the examination. Fingerprint training in 1986, included each student being presented with a set of guidelines to aid in their examinations. Each stage of the process provided has been modified over the years. A better-defined outline is available to the examiner by using the acronym ACE-V. ACE-V is broken down to mean the following:

A- analysis

C- comparison

E- evaluation

V-verification

The Qualitative analysis of the latent impression is the first step in its analysis. Three levels of detail are sought:

- Level 1 - (Flow) flow and class of the ridges which give orientation and exclude other flows and patterns
- Level 2- (Path) what becomes of the ridge; for example, is it an ending ridge or does it bifurcate
- Level 3- (Shape) the analysis of the ridge pores, edges and width and their relationships with the other levels

This leads back to the first conclusion that fingerprints are a permanent and unique phenomenon.

Based on this a fingerprint can be identified if sufficient clarity (quality) and quantity of friction ridge detail are available. Each element of ACE- V can be broken down and establishes questions for the examiner:

A- Analysis

- Does the print contain Level, Level 2, or Level 3 detail?
- Is the print clear? How clear is it?
- Is distortion present? Does the distortion cause a problem?
- Is finger pressure an issue?
- Are double impressions from the shifting of the hand present?
- Are overlapping prints present?
- Is interference from the receiving surface present?
- Is the use of too much or too little powder an issue?
- Is the reversal of ridges or furrows present?

C- Comparison

- Examination of Level 1 detail begins.
- The flow and pattern configuration is viewed in an attempt to find a common area in both the latent and known print.
- Systematically Level 2 and 3 follow.

E- Evaluation

The questions begin to be answered.

- Do I have an agreement? If yes, is there sufficient detail to individualize the print?
- These questions, however, are often answered based on the examiners knowledge, ability and experience.
- At this point the examiner has formed an opinion regarding the identification.

V - Verification

Once the examiner has reached an opinion,

- The identification is forwarded to another examiner who will begin the entire process again.
- In most cases, identification is not effected unless two qualified latent print examiners come to the same conclusion.

Meagher and the FBI's statistical study has now set a standard for other examiners to use when faced with a Daubert issue. Therefore, the testimony can be based upon a testable hypothesis.

The third factor; is whether there is a known potential rate of error associated with the method. There is no error when it comes to the identification of a fingerprint; either it is or it is not one. Unfortunately, like other professions, unqualified examiners can make erroneous conclusions which tend to cast doubt on the entire science. The discovery of "erroneous" identifications are usually discovered in the verification stage.

The last factor: is whether the method is generally accepted in the scientific community leads back to the introduction. It has been established that fingerprints have been a means of personal identification for over one hundred years. During those years, no two people in this world have been found to possess identical friction ridge detail. The use of fingerprints for identification is used by authors in books, is the plot in television shows and used in courts of law.

FINDINGS

While researching fingerprint identification, two important issues were noted. One focused on the rate of error in the science. One article pointed out that there is no empirical data available. The article was correct in its statement because there is no error in the identification process. The only ones that could even be considered would be the ones that are illegal and made by the overzealous or untrained examiner. Another intriguing article pointed out that the identifications were subjective. This statement is one Dr. David Stoney, Ph.D., from the McCrone Institute believes in. Dr. Stoney agrees with the other factors in fingerprint identification, however the fact that the human element is involved in the identification process makes it subjective.

The human element will always be involved whether a person or a computer is used. A human would be running the computer test and a human built the computer. In an attempt to determine how *Daubert* (1993) affects testimony in courts in the author's county, Mike Elliot with the Galveston County District Attorney's Office was interviewed. Mr. Elliot was asked his opinion of *Daubert* (1993) and its relevance to our courts regarding the admissibility of fingerprints as a science. He responded by saying the case sets forth the framework courts use in determining the admissibility of expert testimony. However, the case gives the court a fair amount of discretion in making its determination. Elliot submits that *Daubert* (1993) outlines the principles that the court must look at in determining whether fingerprint evidence is admissible.

Mr. Elliot was asked what basis was used to determine if the examiner could be considered an "expert" in the fingerprint identification field. He pointed out that the individual's training and background qualifications were key along with prior testimony. The question regarding the subjective nature of the identification was posed to him. He pointed out that the examination was subjective. He added that as long as humans are relied upon to give interpretations, the identification will always be subject to some level of scrutiny. The greater the experience level of the examiner, the less scrutiny he or she may have to endure. Lastly, he was asked if *Daubert* impacts our courts now or will it in the future. He closed by saying it already impacts our courts. Hundreds, if not thousands, of cases each year are decided using the standards set forth in *Daubert* (1993). However, fingerprint testimony is responsible for many of the cases resulting in guilty verdicts.

Mr. Sam Finegan, a defense attorney and former prosecuting attorney was also interviewed as part of this research. Mr. Finegan was asked his opinion of *Daubert* (1993) and its relevance to our courts regarding the admissibility of fingerprints as a science. He provided the

following response. He stated the relevance will more likely be felt as to the qualification of the particular witness being offered as an expert. The science itself is of a fairly well-established nature, not 'junk science'. Daubert is used to debunk. Mr. Finegan believes the key to maintaining the integrity of fingerprint evidence in court is to always have an obviously qualified examiner as the testifying witness.

Mr. Finegan was asked to identify the basis that would be used to determine if the examiner was an expert in the fingerprint identification field. He provided the following:

- Whether the expert has been properly trained and has experience in the subject field
- Whether the experts opinion lend itself to verification by testing
- Whether the expert's opinion has been evaluated in light of the potential note of error that scientific methodology
- Whether the expert has been subjected to peer review
- Whether the expert's opinion is consistent with generally accepted methods used for gathering the relevant scientific evidence in the expert's discipline
- Whether the expert's opinion is based on sufficient facts or data required by Texas Rules of Evidence 702 and 703

When asked if he believed if the identification of fingerprints was subjective, he stated any human endeavor has a subjective quality to it. If the examiners are truly qualified to assess all the factors used in a proper identification, the fingerprint comparison is entirely objective, as

opposed to subjective. Mr. Finegan feels fingerprint identification is far less subjective than many other fields of science.

Mr. Finegan was also asked if he thought Daubert will impact our courts now or in the future. He responded by saying, "absolutely". He feels that the judge is the so-called "gatekeeper" of expert testimony. The "gatekeeper" role has led to opinions/precedents where the courts are having to, more and more, become scientist. It takes us from broad legal principles into more specifics in the judicial analysis. The courts have been more and more willing to exclude evidence in civil cases, which hopefully won't spill over into criminal courts.

DISCUSSION/CONCLUSION

It is said that **DNA (Deoxyribonucleic acid)**, testing is just like a fingerprint. The use of DNA analysis in criminal investigations seems to be moving forward and some believe it will surpass fingerprints as a means of identification. The only problem that can be found with DNA is each of us possession our own genetic code, however identical twins possess the same DNA. It has already been established that twins may have the same fingerprint pattern type but the arrangement of friction ridge skin each possess will be unique to each.

Examiners who encounter a Daubert hearing face issues that have been debated for many years. To overcome fear of a hearing, one needs to educate themselves on the factors of a Daubert hearing. A Daubert hearing can effect anyone who offers opinion evidence as an expert in a court of law. Educational courses are being developed to aid in educating examiners on the new ACE- V method of identification. With this new training examiners should be able to broaden their examinations. The new technique will allow examiners to reexamine latent impressions that would normally be classified as "no value" based on the points they would need to establish identification.

Prior to the research, the author was concerned about the impact Daubert would have on the fingerprint science. However, during the research it became apparent that Daubert will not effect the science, but will effect other disciplines in law enforcement as they spill into criminal court from civil. The use of fingerprints as a positive means of identification, in the author's opinion will never be replaced. The issue of its subjective nature will continue to be a factor, due to the human element involved. Mr. Finegan made it clear, a qualified and highly trained examiner will have little trouble in a court of law when faced with a Daubert hearing.

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