The Reliability and Admissibility of Fingerprint and Bitemark Analyses

David Chandler

Follow this and additional works at: https://digitalcommons.law.buffalo.edu/bpilj

Part of the Criminal Law Commons, and the Evidence Commons

Recommended Citation
Available at: https://digitalcommons.law.buffalo.edu/bpilj/vol32/iss1/2

This Article is brought to you for free and open access by the Law Journals at Digital Commons @ University at Buffalo School of Law. It has been accepted for inclusion in Buffalo Public Interest Law Journal by an authorized editor of Digital Commons @ University at Buffalo School of Law. For more information, please contact lawscholar@buffalo.edu.
A current concern regarding criminal trials and forensic science is the supposed “CSI effect.” This is the controversial theory that the prevalence of forensic science television shows causes jurors to expect a wealth of forensic evidence in criminal cases and may influence jurors to issue acquittals in cases where forensic evidence is lacking. However, the question jurors should be asking is not “where is the forensic evidence” but rather “is this forensic evidence actually reliable.”

If jurors go into the deliberation room with the assumption that all forensic science is as reliable and foolproof as DNA testing,


then they are weighing the evidence from a distorted perspective. Yet, comprehensive studies, such as the one recently conducted by the National Research Council, have shown that some areas of forensic science may be receiving too much credit. Even time-honored techniques such as fingerprint analysis have undergone fresh scrutiny because of cases like that of Brandon Mayfield.

After the Madrid train bombings in 2004, Spanish police recovered a fingerprint off of a bag of detonators and sent that print to the FBI for analysis. The FBI ran the print through a search in its computer database, which yielded 20 possible matches. An FBI fingerprint analyst then conducted a visual comparison and concluded that one of the possibilities did indeed match the print from the bag of detonators. A second FBI fingerprint analyst and a supervisor both agreed with the first analyst’s conclusion. The purported match came from Brandon Mayfield, an Oregon lawyer and a Muslim.

About two months later, the FBI arrested Mayfield on a material witness warrant. Soon thereafter, the United States District Court in Oregon ordered an independent expert to review the FBI.

---

2 “[N]o forensic method other than nuclear DNA analysis has been rigorously shown to have the capacity to consistently and with a high degree of certainty support conclusions about ‘individualization’ (more commonly known as ‘matching’ of an unknown item of evidence to a specific known source).” See infra note 3.


5 Id.

6 Id.

7 Id. at 2.

8 Id. at 1.

9 Id. at 3.
Reliability of Fingerprints

analysts’ conclusions. The court’s analyst agreed that Mayfield’s fingerprint matched the print found on the bag of detonators. Nevertheless, on that same day, Spanish police informed the FBI that they matched the print to an Algerian man named Ouhnane Daoud. After conducting a new comparison and confirming the match to Daoud, the FBI reversed their position and admitted that Mayfield was not the source of the print from the bag of detonators.

Similarly, bitemark evidence has also led to wrongful convictions, such as in the case of Ray Krone. In 1991, a female bartender was found stabbed to death in the bathroom of her bar. The only forensic evidence yielded from the scene was bitemarks left on the victim’s neck and breast. After the police heard that Krone was supposed to help the victim close the bar on the night of her murder, he became a suspect and they took “a styrofoam impression of his teeth.”

At trial, the state’s expert testified that he compared the bitemarks on the victim with the Styrofoam impressions and dental casts from Krone. The expert concluded that Krone’s teeth matched the bitemarks found on the victim. Largely based on the bitemark evidence, the jury convicted Krone and he was sentenced to death. Ten years later, DNA testing was conducted on blood and

11 See id.
12 Id.
13 Id.
15 State v. Kron, 897 P.2d at 621.
16 See id. at 621-22.
17 See id. at 622.
18 See id.
19 See id.
20 See id. at 621-22.
saliva found on the victim. The results exonerated Krone, revealing that a man named Kenneth Phillips was the source of the DNA. Consequently, Krone was released from prison.

Cases like those of Brandon Mayfield and Ray Krone raise the question of how courts decide to admit such forensic techniques into evidence. Rules of evidence govern the admissibility of expert testimony regarding scientific and technical matters, such as forensic analyses. Such rules differ depending on the jurisdiction, but they generally come from case law and/or statutory law. This article will focus on federal rules of evidence and New York’s rules of evidence, particularly in the context of fingerprint and bitemark analyses.

I. LEGAL STANDARDS

In federal court, the admission of expert scientific testimony is governed by the Supreme Court’s decision in *Daubert v. Merrell Dow Pharmaceuticals* and by Federal Rule of Evidence 702. The Supreme Court held in *Daubert* that federal court judges are to serve as gatekeepers in deciding whether to admit expert testimony purportedly regarding scientific knowledge. In so deciding, a judge must consider whether the proposed testimony would assist the jury in understanding or determining a fact in issue. Such an inquiry “entails a preliminary assessment of whether the reasoning or methodology underlying the testimony ... properly can be applied to the facts in issue” and whether that reasoning or methodology “rests on a reliable foundation.”

---

21 INNOCENCE PROJECT, supra note 14.
23 Id.
25 FED. R. EVID. 702.
26 Daubert, 509 U.S. at 592.
27 Id.
28 Id. at 592-93.
29 Id. at 597 (emphasis added).
The Supreme Court detailed several considerations that a federal judge should take into account when evaluating the reliability of “a theory or technique” in proffered expert testimony.\(^\text{30}\) One consideration is whether the theory or technique has been tested.\(^\text{31}\) The Court held that testing is a requirement for admissibility because testing is “what distinguishes science from other fields of human inquiry.”\(^\text{32}\) Furthermore, the Court suggested that a judge consider whether the theory or technique has been peer reviewed.\(^\text{33}\) While not required to prove reliability, “submission to the scrutiny of the scientific community is a component of ‘good science,’ in part because it increases the likelihood that substantive flaws in methodology will be detected.”\(^\text{34}\)

Additionally, a judge should consider the technique’s “known or potential rate of error” as well as “the existence and maintenance of standards controlling the technique’s operation.”\(^\text{35}\) Lastly, a judge should determine whether there is “general acceptance” for the technique within the “relevant scientific community.”\(^\text{36}\) If there is little acceptance for the technique, that is an indication that it might be unreliable.\(^\text{37}\)

The admission of expert scientific testimony is also controlled by Federal Rule of Evidence 702. Before Daubert, Rule 702 provided only that that “a witness [who is] qualified as an expert by knowledge, skill, experience, training, or education, may testify ... in the form of an opinion or otherwise” about their expertise if it “will assist the trier of fact to understand the evidence or to determine a fact in issue ... .”\(^\text{38}\) In light of the Supreme Court’s decision in Daubert, Congress added three more requirements for expert testimony when the expert is qualified by knowledge, skill, experi-

\(^{30}\) Id. at 593-94.
\(^{31}\) Id. at 593.
\(^{32}\) Id.
\(^{33}\) Id.
\(^{34}\) Id.
\(^{35}\) Id. at 594.
\(^{36}\) Id.
\(^{37}\) Id.
ence, training, or education. Now, “the testimony [must be] based on sufficient facts or data,” it must be “the product of reliable principles and methods,” and “the expert [must have] reliably applied the principles and methods to the facts of the case.” Thus, even if the technique itself is reliable, the expert must still have employed reliable principles and methods in applying the technique for the case at bar.

*Daubert* superseded the “general acceptance test” from *Frye v. United States*. However, *Daubert* only applies to federal courts. Some states, including New York, still use the *Frye* test. Under the *Frye* test, “expert testimony based on a scientific principle[] or procedure[]” is only admissible if it “has gained general acceptance in its specified field.” The scientific principle or procedure does not have to be unanimously accepted by the scientific community; it just has to be generally accepted as reliable. The *Frye* test is stricter than the test in *Daubert* as *Daubert* does not mandate there be general acceptance in the scientific community in order to find that a scientific principle or procedure is reliable. Still, *Frye* hearings are only required for novel scientific evidence. “Once a scientific procedure has been proved reliable … [c]ourts thereafter may take judicial notice of reliability of the general procedure.”

---

39 Fed. R. Evid. 702 (advisory committee’s notes).
40 Fed. R. Evid. 702(b).
41 Fed. R. Evid. 702(c).
42 Fed. R. Evid. 702(d).
43 Frye v. United States, 293 F. 1013 (D.C. Cir. 1923).
45 Wesley, 83 N.Y.2d at 422 (citing Frye, 293 F. at 1014).
47 Daubert, 509 U.S. at 594.
48 Wesley, 83 N.Y.2d at 436 (Kaye, C.J., concurring).
49 Id.
II. THE POLYGRAPH: A FORENSIC TECHNIQUE THAT HAS BEEN RULED INADMISSIBLE

The polygraph examination is an example of a forensic technique that has been precluded under the *Frye* test. In finding that the polygraph is not generally accepted in the scientific community, the New York Court of Appeals looked outside the polygraph community to determine the procedure’s reliability. The Court did not merely take those in the polygraph community at their word. In fact, the Court disregarded the assertion claimed by polygraph companies and instructors that the test has a 1% error rate. The Court noted that this statistic is “meaningless” because guilty people who lie during the test are not going to tell their examiners when they get false negatives. A guilty person who passes their polygraph is obviously not going to inform the police that the polygraph machine erred and admit to lying during the test.

Instead of relying solely on the polygraph community, the Court looked generally to “commentators on the subject.” In finding polygraph evidence inadmissible, the Court focused on the assertions of polygraph critics. For example, it highlighted that there is no proof that lying causes the kinds of physiological reactions which the polygraph machine measures. In addition, the Court pointed out that “physical or mental abnormalities” could skew the results of the test, making the test unreliable. Furthermore, the Court relied on the assertion that polygraph examiners are not properly trained. The polygraph test involves areas of medicine, psychology, and sociology, but most examiners aren’t trained in those areas. Finally, in noting how much polygraph evidence could sway the minds of a jury, the court ruled, “the criterion for interpretation

---

51 Id. at 514-15, 517.
52 Id. at 515.
53 Id. at 514-16.
54 Id. at 515.
55 Id.
56 Id. at 516.
of the [polygraph] test chart has not as yet become sufficiently definite to be generally reliable so as to warrant judicial acceptance.

III. FINGERPRINT ANALYSIS

A. Background

The forensic technique of fingerprint analysis is part of the larger forensic subset known as “friction ridge analysis.” Friction ridges include fingerprints, palm prints, and prints from the soles of one’s feet. Friction ridges have been used as a form of identification since around 221 B.C., during the Qin Dynasty of China. During this time period, the Chinese often signed documents with their fingerprints or palm prints. They were also among the first to use friction ridge patterns as criminal evidence.

B. Explanation of the Process

The current method of fingerprint analysis is called ACE-V, which stands for Analysis, Comparison, Evaluation, and Verification. In the first step, analysis, the examiner looks at the details of a latent print. A latent print is an unintentionally deposited fingerprint, such as one left at a crime scene by a perpetrator. The quality of the latent print’s details can be affected by a number of factors including scars, skin diseases, residue on the skin, the amount of

57 Id. at 517-18.
58 NATIONAL RESEARCH COUNCIL, supra note 3, at 136.
59 Id.
60 Jeffrey G. Barnes, National Institute of Justice, Chapter 1: History, in THE FINGERPRINT SOURCEBOOK 1-3, 1-4.
61 Id.
62 Id.
63 NATIONAL RESEARCH COUNCIL, supra note 3, at 137.
64 Id.
pressure of the skin on the surface in making the print, rotation and/or torsion of the skin when making the print, the characteristics of the surface containing the print, how the print was collected, and the amount of the friction ridge in the print.66

After analyzing the latent print, the examiner decides whether there is enough quality detail to compare it to known prints.67 Collections of known prints are stored in electronic databases such as the FBI’s Integrated Automated Fingerprint Identification System (IAFIS).68 If there is enough detail in the latent print, the examiner will enter the print into an electronic database, which will ideally narrow down the search to several possible matches.69 The examiner then compares the latent print to each of the possible matches, identified by IAFIS.70 In that comparison, the examiner looks for details that the latent print shares with the possible match.71 Such details include the ridge patterns, the locations and types of ridge minutiae, and the location of the core and delta in relation to ridges.72 Ridge patterns come in arches, loops, and whorls.73 Ridge minutiae include characteristics such as islands, dots, bifurcations, and ending ridges.74 In prints with loop patterns, “[t]he center of the loop is called the core, and the triangular pattern where the outermost looped ridge lines meet the horizontal ridge-line pattern running across the base of the fingertip is called the ‘delta.’”75

66 NATIONAL RESEARCH COUNCIL, supra note 3, at 137.
67 Id. at 138.
68 See Kenneth R. Moses et al., Automated Fingerprint Identification System, in THE FINGERPRINT SOURCEBOOK 6-1, 6-12.
69 See OFFICE OF THE INSPECTOR GEN., supra note 4, at 1.
70 See id.
71 NATIONAL RESEARCH COUNCIL, supra note 3, at 138.
72 LARRY RAGLE, CRIME SCENE: FROM FINGERPRINTS TO DNA TESTING—AN ASTONISHING INSIDE LOOK AT THE REAL WORLD OF C.S.I. 105-06 (2002).
73 Laura A. Hutchins, Systems of Friction Ridge Classification, in THE FINGERPRINT SOURCEBOOK, 5-1, 5-7 (2011).
75 DAVID OWEN, HIDDEN EVIDENCE: 50 TRUE CRIMES AND HOW FORENSIC SCIENCE HELPED SOLVE THEM 166 (Asha Savjani ed., 2d ed. 2009).
The next step is for the examiner to evaluate whether there is “sufficient quantity and quality ... of detail” in common “between the latent print and the known print.”76 This evaluation is conducted based on the examiner’s experience.77 If the examiner concludes that there is enough detail in common between the prints, he/she identifies the latent print and the known print as having come from the same source.78 If the examiner decides that there is enough detail in disagreement, he/she identifies the prints as having come from different sources.79 However, if the examiner cannot find enough detail in common or enough detail in disagreement, then he/she deems the comparison inconclusive.80

Finally, the last step is verification.81 This is when a different examiner conducts a second comparison of the latent and known prints.82 If the second examiner comes to the same conclusion as the first, then the comparison is deemed verified.83 However, the verification is not necessarily blind; sometimes the second examiner already knows what the first examiner determined before he/she conducts the verification.84

C. Reliability Problems with Fingerprint Analyses

Contrary to the common claim, there is no empirical proof that everyone’s fingerprints are unique.85 The uniqueness of fingerprints cannot be proven since not everyone’s fingerprints are recorded and there is no method to compare the fingerprints that are on record.86 Moreover, even if everyone’s fingerprints are unique, that “does not guarantee that prints from two different people are

76 NATIONAL RESEARCH COUNCIL, supra note 3, at 138.
77 Id.
78 Id.
79 Id.
80 Id.
81 Id.
82 Id.
83 Id.
84 Id.
85 RAGLE, supra note 73, at 103-04.
86 Id. at 104.
always sufficiently different that they cannot be confused, or that two impressions made by the same finger will also be sufficiently similar to be discerned as coming from the same source.”

Unlike DNA, there are no existing statistical models that would allow a fingerprint examiner to determine the probability that a latent print came from a suspect. The statistical models in existence only account for matching points of minutiae and do not take the clarity of the latent print into consideration. Nevertheless, when examiners testify that they found a match, “they are communicating the notion that the prints could not possibly have come from two different individuals.” Without adequate statistical models, testifying to this type of certainty is misleading and is even discouraged by some in the “fingerprint community.” The Scientific Working Group on Friction Ridge Analysis, Study and Technology (“SWGFAST”), which publishes guidelines and standards for friction ridge examination, recently issued a new position statement against examiners’ use of the phrase “to the exclusion of all others” in concluding that two prints came from the same source. SWGFAST noted that “[t]he ability of a latent print examiner to individualize a single latent impression, with the implication that they have definitively excluded all other humans in the world, is not supported by research.”

Moreover, the FBI does not even have a standard for the minimum number of points of minutiae that an examiner must find between two prints before he/she declares them a match. In contrast, France requires 24 matching points and Argentina requires 30 matching points. Some U.S. states do require a minimum

87 NATIONAL RESEARCH COUNCIL, supra note 3, at 144.
88 See id. at 139.
89 Id. at 141.
90 Id. at 141-42.
92 Id.
93 Galton Points: Pick a Number, Any Number, 7 NO. 5 CRIM. PRAC. GUIDE 5, (Sept./Oct. 2006) (citing United States v. Crisp, 324 F.3d 261, 269 (4th Cir.).
94 Id. (citing United States v. Mitchell, 365 F.3d 215, 222 (3d Cir. 2004)).
number of matching minutiae, but they vary in the number that they set as the minimum. They generally range from 6 to 12 points. Even so, most of those states still allow experts to testify to a comparison when they have identified less than the minimum number of similar points required in the state. The reasoning behind allowing them to do so is that the deficit goes to the weight of the testimony, not to its admissibility.

The FBI’s lack of a standard for the minimum number of matching minutiae has to do with the tendency of fingerprint analysis in the United States to be kept intentionally subjective. This is to allow examiners to consider both the quantity and quality of comparable details in determining whether a “match” exists. Thus, when a latent print has higher quality details, examiners do not require as many corresponding minutiae to declare a match as they do when there are lower quality details. Yet, this subjectivity makes it so examiners do not always agree with each other’s comparisons. In fact, recent research … has shown that experienced examiners do not necessarily agree with even their own past conclusions when the examination is presented in a different context some time later.

Another issue with the reliability of fingerprint analysis is that the ACE-V method does not prevent bias from affecting the outcome of the analysis. Even though verification is part of ACE-V, if the second examiner conducting the verification knows the outcome of the first examiner’s evaluation, that knowledge could consciously or subconsciously influence his/her conclusion. This problem could easily be remedied if all verifications were conducted blindly.

In addition to calling for more research into population statistics and for blind verifications, the National Research Council

---

95 Id. (citing United States v. Havvard, 117 F. Supp.2d 848, 852 (S.D. Ind. 2000)).
96 CRIM. PRAC. GUIDE, supra note 94.
97 Id.
98 Id. (citing United States v. Havvard, 260 F.3d at 597, 597-98 (7th Cir. 2001)).
99 CRIM. PRAC. GUIDE, supra note 94.
100 NATIONAL RESEARCH COUNCIL, supra note 3, at 139.
101 Id. at 139.
102 Id. at 142.
Reliability of Fingerprints

has made several other recommendations for improving the reliability of fingerprint analyses. For example, there needs to be a process by which examiners detail the steps they took in reaching their conclusions under the ACE-V method. That way, their examinations could be recreated to ensure they were conducted properly. After all, reproducibility is “[t]he hallmark of the scientific process.”

Also, more research should be conducted into the ridge patterns of palms and feet. If such ridge patterns are sufficiently unique, they could be used to help narrow down the possible sources of latent prints. There should also be further research into how common or rare the different types of ridge minutiae are and how frequently different types of ridge minutiae are grouped together in a print. In addition to providing a tool for building statistical models, such research would help courts to assess the reliability of fingerprint analyses.

D. Admissibility in Federal Courts under Daubert

There is a presumption in Federal case law that fingerprint analysis is reliable because it has been “tested” through its use in criminal trials over a long period of time. This seems to be a remnant of what has been called the “witless echo chamber” created by the Frye test: if one court allows fingerprint evidence, a second court does not make an “independent judgment on its admissibility.” Yet, if the fact that a scientific technique has long been admitted in trial courts were good enough to ensure its reliability, there would have been no reason for the creation of the reliability evaluations.

---

103 Id.
104 Id.
106 Id. at 144.
107 Id.
108 Id.
109 Id.
110 See, e.g., Havvard, 117 F. Supp. 2d at 854; see also Crisp, 324 F.3d at 269.
111 See Scheck et al., supra note 106, at 212.
tests in *Daubert* and *Frye*.\textsuperscript{112} It is true that fingerprint evidence has been tested in criminal trials in the sense that in cases where a latent fingerprint is matched to the defendant, that match is corroborated when independent evidence proves the defendant’s guilt.\textsuperscript{113} However such “testing” does not reveal “how accurate [fingerprint evidence] is, or how commonly identification errors are made ....”\textsuperscript{114}

Regarding the peer review assessment suggested by the Supreme Court in *Daubert*, federal courts find it satisfied by noting the long history of fingerprint analysis in criminal trials or by pointing to the verification step of ACE-V.\textsuperscript{115} The problem with this goes back to the issues of verifications not being conducted blindly and the need for examiners to detail their steps in reaching their conclusions for each fingerprint analysis. Examiners should keep enough detail about their process to allow their peers to follow those steps exactly and check if they come to the same result. That kind of peer review is integral to the scientific process.

As for evaluating the error rate of fingerprint analyses, federal courts have ignored the error rate by reasoning that any such error rate would be miniscule and would continue to improve with continued “adversarial testing and challenge” in court.\textsuperscript{116} By doing this, federal courts are not considering the known or potential error rate. If they did, that might force the fingerprint analysis community to administer proficiency tests to skilled examiners. Such tests could reveal at least some semblance of an error rate.\textsuperscript{117}

Moreover, some commentators have opined that courts should determine reliability under *Daubert* in the context of the validity evidence that “could or should have been available with reasonable effort.”\textsuperscript{118} Since it seems that better population statistics

\begin{itemize}
\item \textsuperscript{113} *Id.* at 134.
\item \textsuperscript{114} *Id.*
\item \textsuperscript{115} *See, e.g., Havvard*, 117 F. Supp. 2d at 854.
\item \textsuperscript{116} *Id.*
\item \textsuperscript{117} Mnookin, *supra* note 113, at 137.
\item \textsuperscript{118} Mnookin, *supra* note 113, at 133.
\end{itemize}
Reliability of Fingerprints
can be revealed with further research,\textsuperscript{119} then following the reasoning of these commentators, courts should refuse to admit fingerprint evidence until such further research is conducted.

E. Admissibility in New York Courts under Frye

Although New York employs the stricter Frye test, the courts of that state have deferred to the longstanding use of fingerprint analysis in determining that such techniques are reliable and generally accepted.\textsuperscript{120} New York courts, like other courts applying Frye, seem to find fingerprint evidence sufficient as long as the fingerprint expert testifies that he/she followed the techniques practiced by other fingerprint experts.\textsuperscript{121} Again, this is that “witless echo chamber” common with Frye courts.

Part of this may have to do with New York requiring a Frye analysis only for novel scientific evidence. On the other hand, while fingerprint analysis is not novel, new evidence about its reliability and degree of acceptance in the scientific community could be considered “novel scientific evidence.” That seems to have been the case in People v. Hyatt.\textsuperscript{122} In Hyatt, the court applied a Frye test to a defense expert’s proposed testimony about recent research calling the validity of fingerprint analysis into question.\textsuperscript{123} However, the New York court called the expert’s proffered testimony “junk science.”\textsuperscript{124} The court was extremely hesitant to second-guess the admissibility of fingerprint evidence: it held that “[t]o take the crown away from the heavyweight champ you must decisively out score or knock him out. Going twelve (12) rounds will just not do.”\textsuperscript{125} The court held that the offered expert testimony was

\textsuperscript{119} Further research could allow analysts to determine the probability that a latent print came from a suspect. This would obviously enhance the reliability of fingerprint analyses. NATIONAL RESEARCH COUNCIL, supra note 3, at 141.

\textsuperscript{120} See People v. Burnell, 89 A.D.3d 1118, 1122 (2011).

\textsuperscript{121} See BARRY SCHECK ET AL., supra note 106, at 212.


\textsuperscript{123} Id.

\textsuperscript{124} Id.

\textsuperscript{125} Id.
“interesting but too lacking in scientific method to even bloody the field of fingerprint analysis as a generally accepted scientific discipline.”¹²⁶

That holding stands in stark contrast to the New York Court of Appeals case that precluded polygraph evidence.¹²⁷ Just like with interpretations of polygraph test results, there is a lack of definite standards for fingerprint comparisons.¹²⁸ In addition, as with polygraph evidence, there are many circumstances in which admitting fingerprint evidence would have “tremendous weight ... in the minds of a jury.”¹²⁹ Therefore, when the accuracy and general acceptance of certain fingerprint evidence is not “clearly recognized,”¹³⁰ New York courts “should be most careful in admitting [it] into evidence ....”¹³¹

IV. BITEMARK ANALYSIS

A. Background

Bitemark analysis is a forensic technique involving the identification and comparison of bitemarks.¹³² It is a subset of forensic odontology, which also encompasses the identification of bodies and the interpretation of oral injuries.¹³³ As far back as 11th Century England, people sometimes bit into wax seals on documents in order to mark them.¹³⁴ One of the first uses of bitemark analysis in the criminal context was in the Salem Witch Trials, specifically the case of George Burroughs in 1692.¹³⁵

¹²⁶ Id.
¹²⁷ Leone, 25 N.Y.2d 511.
¹²⁸ NATIONAL RESEARCH COUNCIL, supra note 3, at 140.
¹²⁹ Id. 25 N.Y.2d at 518.
¹³⁰ Id.
¹³¹ Id.
¹³² NATIONAL RESEARCH COUNCIL, supra note 3, at 173.
¹³³ Id. at 7.
B. Explanation of the Process

The American Board of Forensic Odontology (ABFO) issues guidelines for the methodology of bitemark analyses. The first step in the process is to preserve the bitemark. Bitemarks are often found on human skin. Hence, one can preserve a bitemark by photographing it, casting an impression of the surface that the bitemark is on, and by cutting out the piece of tissue containing the bitemark. Examiners should also record details of the bitemark including the location of the mark on the object, whether the surface containing the mark is “flat, curved or irregular,” the characteristics of the tissue that the mark is on, as well as the shape, color and size of the mark.

After preserving the bitemark, the examiner needs something to compare it to, so he/she must obtain dental samples from a suspect. One way to do this is to photograph the suspect’s face and teeth. Another way is to examine the suspect’s face and mouth and record the observations. Additionally, the examiner can take dental impressions from the suspect. The ABFO recommends taking two impressions of the top of the mouth and two of the bottom. The examiner can also take sample bites from the suspect.

The next step is to compare the bitemark to the suspect’s samples. One way to do this is to overlay the suspect’s sample...
onto the bitemark. This can be accomplished by tracing the suspect’s dental cast onto a piece of paper, or printing an image of the cast onto transparency film, and physically overlaying it onto the bitemark. Another way is to use a computer to enhance or make a digital copy of the bitemark and the suspect’s teeth and then make the comparison using the digital copies.

In conducting a bitemark comparison, the examiner will look for distinguishing features and patterns. There are two types of characteristics that may be observable in a bitemark: class characteristics and individual characteristics. Class characteristics indicate the type of teeth in the bitemark (i.e. canines, incisors, etc.). Individual characteristics include the way the teeth are arranged along with the number, specificity, and clarity of “individual tooth variation[s].” Individual characteristics are most useful in assessing the likelihood that the bite mark came from a certain person.

C. Reliability Problems with BiteMark Analyses

One issue that affects the reliability of bitemark analysis is that, even when using the ABFO’s guidelines for analyzing bitemarks, experts often come to different conclusions. Moreover, there is no requirement that analysts adhere to the ABFO’s guidelines. In addition, there are no adequate studies showing that bitemarks are unique to each individual person. While some studies have supported the uniqueness of bitemarks, those studies have looked at bitemarks that have “more teeth than are seen in most...
bitemarks submitted for comparison.” Furthermore, even if people have unique dentitions, there is inadequate data to establish that a unique dentition can make a “unique pattern … on … human skin” or that the skin can “maintain that uniqueness.” Thus, there is insufficient proof that “bitemark comparisons can result in a conclusive match” to one person and to the exclusion of all others. Even the ABFO does not sanction bitemark experts concluding that a comparison resulted in “an unconditional identification of a perpetrator, or without doubt.”

Another issue with the reliability of bitemark analysis is that, unlike fingerprints, there is no database of bitemarks or bitemark patterns. This makes it difficult to obtain population statistics. Therefore, in cases where a comparison of a bitemark to a suspect’s sample does not rule that person out as the source of the mark, there is no way of knowing what percentage of the population could also be the source.

Also unlike fingerprints, bitemarks are not compared to samples from multiple people; they are often only compared to samples from one suspect. Since there is no database of bitemarks, examiners can only compare a bitemark to the dentition of a suspect and police usually supply few suspects for comparison. Furthermore, as with fingerprint analyses, bitemark analyses are subjective; they are largely based on the examiner’s experience. There is no “standard for the type, quality, and number of individual characteristics required to indicate that a bitemark has reached a threshold of evidentiary value …” Consequently, there is a potential for bias.

---

159 Id.
160 Some experts contend that human skin is a poor medium for retaining the detail of a bitemark. See id. at 176.
161 Id. at 175.
162 Id. at 175.
163 AM. BD. OF FORENSIC ODONTOLOGY, supra note 137, at 119.
164 NATIONAL RESEARCH COUNCIL, supra note 3, at 174.
165 Id.
166 See id.
167 Id. at 174-75.
168 Id. at 175.
169 Id. at 176.
influencing the outcome of the comparison. This bias problem might be remedied somewhat if a second analyst verified the first analyst’s conclusions; but such a verification technique is not often employed.\textsuperscript{170}

D. Admissibility in Federal Courts under \textit{Daubert}

Very few federal courts have conducted a post-\textit{Daubert} analysis of bitemark evidence. Of those courts that have, none has outright rejected bitemark evidence as unreliable under \textit{Daubert}. In one case, after a \textit{Daubert} review, the court upheld the admission of testimony from two bitemark experts.\textsuperscript{171} Yet, in that case, the experts only testified that they could not exclude the defendant as the source of the bitemark and that the defendant was “capable of causing” the bitemark.\textsuperscript{172} Thus, the court upheld bitemark analysis as reliable for including or excluding a person as a possible source; but it did not decide on the reliability of bitemark analysis for concluding that an individual is conclusively the source of a bitemark.

Another federal court upheld an admission of a bitemark examiner as an expert under \textit{Daubert} based solely on the fact that the examiner had considerable experience.\textsuperscript{173} However, like in the other case, the examiner did not testify to whether the defendant was the conclusive source of the bitemark. To the contrary, the examiner was a defense witness who testified that it was impossible to scientifically establish the defendant as the source of the bitemark.\textsuperscript{174}

If a federal court did conduct a \textit{Daubert} analysis of proffered bitemark testimony concluding that a particular mark positively came from a defendant, the court would have to rule it inadmissible. Such a theory has not been tested; there is no adequate evidence that

\textsuperscript{170} See \textit{id}. at 175.
\textsuperscript{172} \textit{id}.
\textsuperscript{173} He was a professor of odontology at a university and was a fellow of the American Society of Forensic Odontology. Hill v. City of Chicago, No. 06 C 6772, 2011 WL 2461362, at *3 (N.D. Ill. June 20, 2011).
\textsuperscript{174} \textit{id}. at *4.
bitemarks are unique to each individual person. Consequently, the theory of bitemark uniqueness has not passed Daubert’s testing requirement. Even if the proffered testimony is not absolutely conclusive but instead asserts that a bitemark has a particular probability of coming from a defendant, that too would not survive a Daubert analysis. Since there are no current population statistics, one cannot know what percentage of the population could be the source of a particular bitemark.

E. Admissibility in New York Courts under Frye

As with fingerprint evidence, New York courts defer to the longstanding use of bitemark analyses in finding such evidence admissible under the Frye test. The New York Court of Appeals held that bitemark evidence has been generally accepted in the scientific community and thus, its reliability does not have to be established in each case. The court’s reasoning was largely based on the fact that bitemark evidence has been admitted in New York courts for a long time.

The defense in that case conceded that bitemark analysis might be reliable enough to exclude a suspect, but argued that it “has not been sufficiently accepted by the scientific community to permit its use as a means of identifying a perpetrator.” Nevertheless, the Court responded by holding that the procedure does not have to be “unanimously indorsed by the scientific community ... [only] generally acceptable as reliable.” The Court went on to find that the techniques used in bitemark comparisons “are accepted and approved by the majority of experts in the field.” This opinion seems to be largely based on the fact that all the New York appellate

175 NATIONAL RESEARCH COUNCIL, supra note 3, at 174.
176 Id.
178 Id. at 49-50.
179 Id.
180 Id.
181 Id.
courts that have evaluated bitemark analysis have found it to be reliable.\footnote{182 Id. at 49-50.}

Moreover, the Court was swayed by the expert’s testimony that “the odds against the characteristics found identifying defendant being duplicated in any other person’s mouth were ‘astronomical.’”\footnote{183 Id. at 50-51.} Thus, the Court adopted the expert’s claim as gospel, even though there is a dearth of adequate evidence scientifically establishing that bitemarks are unique.\footnote{184 NATIONAL RESEARCH COUNCIL, supra note 3, at 175.} Despite the fact that New York courts apply the supposedly stricter \textit{Frye} test, the state’s highest court has gone farther than any federal court applying \textit{Daubert} by essentially holding that bitemark examiners can testify to finding an unconditional identification. This flies in the face of reason since unconditional identifications are not even sanctioned by the American Board of Forensic Odontology.\footnote{185 AM. BD. OF FORENSIC ODONTOLOGY, supra note 136, at 119.}

\section*{V. CONCLUSIONS}

In order to improve the reliability of fingerprint and bitemark analyses, courts should only admit such evidence after the proffered comparison has been verified by several examiners through their own blind comparisons. Additionally, courts should not allow fingerprint or bitemark examiners to testify to an individual being the only possible source of a fingerprint or bitemark; courts should only allow them to testify that an individual could be the source or that an individual’s ridge patterns or dentition is consistent with a latent print or bitemark.

Claims that fingerprint analyses have a zero error rate are at least as unfounded as the similar claims regarding polygraphs, which were discounted by the New York Court of Appeals.\footnote{186 Leone, 25 N.Y.2d at 514-15, 517.} A committee of the National Research Council found that human errors are made in conducting the subjective comparisons and

\begin{itemize}
\item \footnote{182 Id. at 49-50.}
\item \footnote{183 Id. at 50-51.}
\item \footnote{184 NATIONAL RESEARCH COUNCIL, supra note 3, at 175.}
\item \footnote{185 AM. BD. OF FORENSIC ODONTOLOGY, supra note 136, at 119.}
\item \footnote{186 Leone, 25 N.Y.2d at 514-15, 517.}
\end{itemize}
evaluations of fingerprint analyses.\textsuperscript{187} Better statistical models for fingerprints must be developed to narrow down “the possible donor population of a particular print.”\textsuperscript{188} Additionally, more unified standards must be agreed upon by the fingerprinting community.\textsuperscript{189} Only then might an unconditional fingerprint identification be reliable enough to be admitted. Until such improvements are made, fingerprint examiners should only testify as to whether an individual is consistent or inconsistent with being the source of a particular latent print.

Similarly, bitemark analysis is clearly inadequate for determining that a particular mark came from one individual to the exclusion of all others. Proof of this inadequacy is reflected in the several cases where people were convicted of crimes based on bitemark evidence and later exonerated by new DNA evidence.\textsuperscript{190} Furthermore, forensic odontologists must come to an agreement on appropriate standards for comparing bitemarks.\textsuperscript{191} Reliable statistical evidence must also be developed to determine whether bitemarks are unique enough across the population to render bitemark evidence of any probative value.\textsuperscript{192} Until those advancements are made, expert opinions regarding bitemark analyses should only extend to excluding people as possible sources of a bitemark or opining that a particular person could not be excluded.

The comprehensive report from the National Research Council and other scholarly articles demonstrate that fingerprint and bitemark analyses are generating criticism in the scientific community that is comparable with the criticisms of polygraph testing. Instead of merely ignoring new evidence that questions the reliability of fingerprint and bitemark analyses, courts should hold these

\textsuperscript{187} NATIONAL RESEARCH COUNCIL, supra note 3, at 143.
\textsuperscript{188} Id. at 144.
\textsuperscript{189} Id. at 140.
\textsuperscript{191} NATIONAL RESEARCH COUNCIL, supra note 3, at 176.
\textsuperscript{192} Id. at 174.
longstanding techniques to the same scrutiny given to polygraph testing and other more novel techniques. Such analyses do not have to rise to the reliability of DNA testing, but they do have to conform to the standards of reliability that are the hallmark of the scientific method. To hold them to any other standard is to ignore the purpose behind the rulings in *Frye* and *Daubert*. 