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Samuel D. Hodge Jr.

Robert E. Rains

Alexandra Ewing

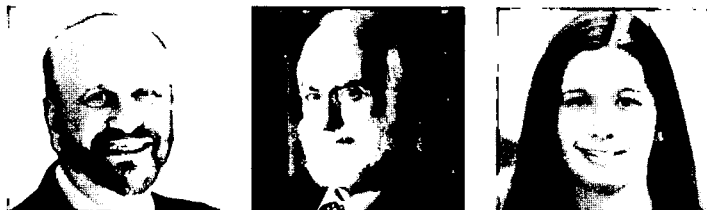
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THE GROWING CONTROVERSY SWIRLING AROUND BITE MARK IDENTIFICATION



SAMUEL D. HODGE, JR. is a professor at Temple University where he teaches both law and anatomy. He has authored more than 150 articles in medical and legal journals and has written six medical/legal texts. He also enjoys an AV preeminent rating and has been named a top lawyer in Pennsylvania on multiple occasions.

ROBERT E. RAINS is a professor emeritus at the Penn State Dickinson School of Law in Carlisle, Pennsylvania. He is the editor of the Pennsylvania Bar Association Quarterly.

ALEXANDRA EWING is a graduate of the Temple University Beasley School of Law. She is a law clerk with the Honorable Vivian L. Medinilla of the Delaware Superior Court.

This is an expansion and update of an article by the authors entitled "Bite Mark Identification—A Reliable Forensic Tool or Junk Science?" which appeared at Pennsylvania Bar Association Quarterly, Vol. 88, No. 2, p. 109 (July 2017).

"Forensic scientists are not policemen. We are scientists.
We deal with matters objectively. We do not act on our suspicions."

— Dr. Cyril Wecht

Dramatizations such as CSI and Forensic Files have elevated scientific techniques to mythical portions of infallibility.¹ That perception is misplaced—crimes are not solved by passing a magical blue light over invisible evidence to identify the perpetrator. Forensic techniques must be meticulously performed to exacting standards. The foundations of science, however, are constantly being reconsidered, and as time advances, new methods or research may show that established scientific principles are incorrect or inadequate.²

FORENSIC SCIENCE

Forensic science encompasses many different fields including forensic dentistry which seeks to identify human remains by their teeth³ or identify a suspect by comparing their dentition with a bite mark found on the victim.⁴ According to one source, "hundreds, if not thousands of defendants" have been convicted based upon this evidence.⁵ Bite mark identification,

however, has undergone vigorous scrutiny in recent years and its admissibility is being challenged on an increasing basis. This article will explain bite mark identification and the controversy surrounding this forensic technique.

INTRODUCTION TO BITE MARK EVIDENCE

Bite mark evidence has been a prosecution tool for more than 65 years⁶ particularly in child abuse, rape, burglary, and homicide cases.⁷ Some have even said that "without bite mark evidence, many violent crimes could not be prosecuted successfully."⁸ The foundation of bite mark evidence is based upon the principle that no two individuals have the identical dentition with respect to size, shape and tooth alignment.⁹ This is not difficult to comprehend when one considers that the dentition of an adult normally consists of thirty-two teeth with each having five anatomic surfaces. Accordingly, 160 surfaces are potentially available for

comparison purposes.¹⁰ When one adds that most adults have had dental work, misalignments, missing teeth, and prosthetics, it is not difficult to comprehend how forensic dentists declare that a bite mark is distinctive to an individual and can be matched to the marks left on the victim's skin.

Critics maintain that while bite mark evidence is alleged to be comparable to DNA with respect to accuracy, "there has been no scientific validation for the notion that a person's dentition is unique to him or her in the same way that fingerprints or DNA are unique to each individual."¹¹

THE PROCESS

The first step involving bite mark evidence is to determine if the impression was created by a human or an animal. The bite is then reviewed for traces of DNA left by the assailant's saliva.¹² This initial process will be followed by the scientist's taking a variety of photographs due to the changing nature of the evidence. Bruising generally appears within a few hours of the bite but disappears inside of a couple of days. The dentists will then obtain measurements of the teeth marks. This is followed by the surgical removal of the bite mark from the skin if the victim is deceased, preserving the specimen in formalin, and creating a silicon cast of the indentation.¹³

The American Board of Forensics Odontology

The American Board of Forensics Odontology ("ABFO") offers board certification to those dentists who perform bite mark identification, and the Board is acknowledged by the American Academy of Forensic Science as a forensic specialty.¹⁴ The ABFO has created guidelines for the collection of bite mark evidence.¹⁵ For instance, a range of techniques can be used, such as "photography, dental casts, clear overlays, computer enhancement, electron microscopy, and swabbing for serology or DNA."¹⁶ Once the materials are collected, an expert in the field will compare the evidence for identification purposes.¹⁷

THE VALIDITY OF BITE MARK IDENTIFICATION

Numerous cases have allowed bite mark identification into evidence with resultant convictions.¹⁸ Typical challenges to the evidence examine the failure of the scientist to follow the appropriate guidelines for the collection of bite mark evidence.¹⁹ The trouble is that

bite marks on human skin will change with time. Natural processes of swelling and healing will also cause marks to change.²⁰ Comparison studies conducted on pig skin immediately, one hour later, and twenty-four hours later demonstrate poor results that increasingly deteriorate with time.²¹ Many factors, such as skin elasticity and unevenness of the bite, can also distort the bite marks.²² The inaccuracy of the underlying evidence obviously calls into question the validity of a subsequent analysis.

Lack of Standard Criteria

The Guidelines of the American Board of Forensics Odontology do not provide the specific criteria needed for each method, nor do they establish the underlying probability of accuracy.²³ While these methods are reasonably reliable when used to exclude suspects, it is not scientifically proven that experts can positively identify a person by their bite mark "to the exclusion of all others."²⁴ There have also been no large scientific or population studies to support whether bite marks are unique enough to an individual or whether they show sufficient detail to make a positive identification.²⁵ The underlying probability of accuracy is also largely unknown, although most studies show incredibly high rates of error.²⁶

Lack of a Proper Scientific Foundation

A major objection to bite mark evidence is that it lacks a proper scientific foundation, as it is not premised upon reliable scientific methodology. Two components of bite mark evidence must be proven as scientifically accurate before any subsequent positive identification is accurate. The first is that human bite marks are unique, and the second is that human skin/bitten objects can record those marks with enough specificity to make an accurate match.²⁷ Neither has been adequately studied, and results show unacceptable rates of error.²⁸

Several scientific bodies have recently issued statements critical of bite mark evidence. The National Academy of Sciences,²⁹ the President's Council of Advisors on Science and Technology ("PCAST"),³⁰ and the Texas Forensic Science Commission³¹ are heavily critical of bite mark evidence. Each organization has concluded that bite mark analysis does not meet scientific standards for foundational validity.³² In fact, the National Academy of Sciences singled out bite mark identification for some of its harshest words.³³ The

Texas Forensic Science Commission was so concerned that it requested a moratorium on the use of bite mark evidence until certain standards are met.³⁴ In 2016, the *Journal of Law and Biosciences* joined the mounting list of critics when it published an article critical of bite mark identification.³⁵ The article noted “that recent reviews...as well as recent empirical findings, have underscored the lack of reliability and validity of the most fundamental claims about the ability of forensic dentists to identify the source of bite marks on human skin.”³⁶ Another dagger to the validity of bite mark evidence was contained in a study published in the *Journal of Forensic Sciences* that concluded “bite mark analysis in an open population [is] unsupportable.”³⁷

Convictions reversed on the bases of DNA evidence have been studied, and it has been ascertained that forensic science ranks second behind eyewitness mistakes as the leading source of false or misleading evidence. In fact, mistake rates by forensic dentists were determined to be some of the highest “of any forensic identification specialty still practiced.”³⁸

Organizations that Reject the Criticism of Bite Mark Evidence

The Department of Justice, the FBI, prosecutors, and forensic dentists reject the criticism levied at bite mark identification. For instance, the Department of Justice has stated that it will ignore the report from the President’s Council of Advisors on Science and Technology, and the FBI called the report “erroneous and overbroad.”³⁹ The American Congress of Forensic Science Laboratories, an industry trade group, attacked the President’s Council report as being “motivated by politics or perhaps by some desire to undermine the criminal justice system.”⁴⁰ However, the accuracy of bite mark identification has been criticized by several prominent organizations, and it will be up to the courts as gatekeepers to determine whether to follow the long line of cases that have accepted bite mark identification or whether the recent criticism concerning the lack of valid scientific studies will make a difference on admissibility.

EVOLVING FEDERAL STANDARDS FOR EXPERT TESTIMONY

In 1923, the Federal Court of Appeals for the District of Columbia articulated what has become known as the Frye test for assessment of scientific evidence. In *Frye v. United States*, the defendant had unsuccessfully

sought to introduce expert evidence of his supposed innocence based on the results of a “systolic blood pressure deception test.”⁴¹ Upholding that refusal, the Court of Appeals explained: “while 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.”⁴²

This “general acceptance” test has remained extremely influential over the decades.

In 1975, Congress enacted the Federal Rules of Evidence⁴³ setting a new standard for expert testimony. As originally enacted, Federal Rule 702 simply provided: “If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise.”⁴⁴

Almost two decades after enactment of the Federal Rules of Evidence, the United States Supreme Court addressed the continuing vitality of the Frye test in light of those Rules. In *Daubert v. Merrell Dow Pharmaceuticals*, the Court concluded that, “the Frye test was superseded by adoption of the Federal Rules of Evidence.”⁴⁵ It held that the “austere” Frye “general acceptance” test was “incompatible with the Federal Rules of Evidence, [and] should not be applied in federal trials.”⁴⁶ But the Court cautioned that not all so-called expert testimony is admissible. “[U]nder the Rules, the trial judge must ensure that any and all scientific testimony or evidence admitted is not only relevant, but reliable.”⁴⁷

Faced with a proffer of expert scientific testimony, then, the trial judge must determine at the outset, pursuant to Rule 104(a), whether the expert is proposing to testify to (1) scientific knowledge that (2) will assist the trier of fact to understand or determine a fact in issue. This entails a preliminary assessment of whether the reasoning or methodology underlying the testimony is scientifically valid and of whether that reasoning or methodology properly can be applied to the facts in issue.⁴⁸

A “key question” in determining “whether a theory or technique is scientific knowledge that will assist the trier of fact will be whether it can be (and has been) tested.”⁴⁹ “Another pertinent consideration is whether

the theory or technique has been subjected to peer review and publication.⁵⁰ Additionally, the trial court “ordinarily should consider the known or potential rate of error.”⁵¹ Moreover, Daubert does not completely abandon the “general acceptance” test:

Finally, “general acceptance” can yet have a bearing on the inquiry. A “reliability assessment does not require, although it does permit, explicit identification of a relevant scientific community and an express determination of a particular degree of acceptance within that community.”...Widespread acceptance can be an important factor in ruling particular evidence admissible, and “a known technique which has been able to attract only minimal support within the community,”...may properly be viewed with skepticism.⁵²

COURT CASES ON BITE MARK EVIDENCE

The lack of scientific accuracy and the various critical studies have made little difference in the courts, and bite mark evidence is routinely admitted in most jurisdictions.⁵³ The growing criticism from the scientific community appears to have fallen on deaf ears. Courts continue to admit bite mark evidence because other courts have done so in the past, rather than engaging in a proper analysis of the underlying methodology as required by most rules of evidence.⁵⁴ In a particularly telling opinion, the Sixth Circuit opined that “[b]ite mark evidence may by its very nature be overly prejudicial and unreliable, but it may nevertheless be admitted under Michigan evidence law and we do not question the Michigan courts’ judgment with respect to admission.”⁵⁵ Most challenges seem to be successful only when based on other exonerating evidence, such as DNA evidence.⁵⁶

A Texas state court concluded that although the NAS Report showed many deficiencies in the field of forensic odontology, the report “does not conclude that bite mark evidence has lost general acceptance in the scientific community, nor does it call for universal exclusion of such evidence.”⁵⁷ Instead, any deficiencies in the field should go to the weight of the evidence, rather than admissibility.⁵⁸ A federal district court sitting in Minnesota was also not impressed with the NAS report.⁵⁹ In *State v. Jenkins*, the defendant maintained that the bite mark evidence lacked a proper foundation, was not scientifically reliable, and was speculative. The court dismissed the argument and noted that the

National Academy of Science study was not “binding legal precedent” and that bite mark evidence was generally admissible evidence under Frye.⁶⁰ Given the strong wording of the NAS Report, it is unclear what would be needed to persuade the judiciary. Perhaps challenges based upon the strongly worded PCAST and Texas Forensic Science Commission reports will be more successful.

Louis M. Natali, Jr, a Temple University Law School professor, offered a pragmatic explanation as to why judges may be reluctant to abandon the long-established rule of admissibility in a bite mark case. He noted that many state judges “are under enormous pressure because they need to seek reelection” and the average citizen does not understand why evidence would be kept out of court that links a defendant to the crime. Professor Natali further commented, “bite mark evidence is very weak and has no real scientific support.” Therefore, one can only hope that the “National Research Council will continue its efforts to publicize the shortcomings of those techniques that have not been scientifically validated and the courts will begin to pay attention.”⁶¹ Radley Balko, a contributor to articles on forensic evidence for the Washington Post, noted that “bite mark analysis isn’t hard evidence... but it is presented to juries as science.”⁶² This creates a dilemma since “jurors aren’t qualified to distinguish good science from bad”⁶³ and “bite mark evidence is entirely subjective.”⁶⁴

In the Florida case of *State v. O’Connell*, defense counsel filed a motion in limine to exclude bite mark testimony, but it was denied.⁶⁵ The defense maintained that multiple convictions based upon faulty bite mark testimony have been reversed, no statistical studies have confirmed the accuracy of the science, and the experts’ conclusions were not based upon any scientific or other specialized knowledge.⁶⁶ The court denied the motion and concluded that the dentist’s bite mark testimony is not novel science, but pure opinion and not subject to Frye. The court further noted that just because there is a lack of studies or databases as to the accuracy of the test that “is not an accurate indicator of its reliability.”⁶⁷ After all, the court went on to say, “bite mark identification or analysis has been accepted in Florida courts as early as 1984, and has been found to be generally accepted in the relevant scientific community in other jurisdictions.”⁶⁸ This reluctance to prohibit bite mark identification testimony may be changing as more and more people became aware of the

weaknesses in the evidence. Also, courts are starting to recognize that a conviction can be challenged on a due process basis if flawed forensic evidence was used that “undermined the fundamental fairness of the entire trial.”⁶⁹

Frimpong v. MacDonald involved a rape conviction before a federal district court in California.⁷⁰ It was alleged that the bite mark on the victim’s cheek could not have been made by the defendant, and there was conflicting testimony from the forensic odontologists.⁷¹ The court responded that the conflicting testimony from the dentists “merely creates doubt as the reliability of the bite mark evidence.” It does not, however, “provide evidence that the petitioner is probably innocent.”⁷² One year later, however, the result changed. In 2015, the California Supreme Court reversed a conviction partially based upon bite mark identification as questionable science. In *In re Richards*,⁷³ a man’s conviction was overturned after a bite mark expert recanted his trial testimony. The court found that the experts’ opinion was “false evidence” because the experts repudiated their trial testimony and because the trial testimony had been “undermined by subsequent scientific research or technological advances.”⁷⁴ But in doing so, the court still largely relied upon the work of bite mark experts. Rather than focusing on lack of scientific accuracy, the court detailed how new technological advances repudiated the trial testimony. Based upon these advances, the experts could no longer make a positive identification or even agree if the lesion was a bite mark.⁷⁵

A Texas man’s conviction was also overturned after he spent twenty-eight years in jail based upon bite mark identification.⁷⁶ Steven Chaney, a former construction worker, was convicted of murder in the stabbing death of a couple based upon the testimony of forensic dentists who linked bite marks found on one of the victims’ arms to the defendant.⁷⁷ The Texas legislature passed a law in 2013 granting relief to those convicted based upon science which has now be shown to lack validity. This allowed the District Attorney’s Office to conclude that the bite mark evidence was faulty. Mr. Chaney has been released from prison while the status of his conviction is pending in appellate court.⁷⁸

A court in Ohio joined the ranks of judges that have discarded bite mark evidence in *Ohio v. Prade*.⁷⁹ The defendant was found guilty of aggravated murder on the basis of bite mark testimony, and an appeal followed

challenging the evidence. After reviewing the report from the National Academy of Science and other critical articles, the judge noted that the scientific basis for bite-mark identification has been seriously questioned and “is now the subject of substantial criticism that would reasonably cause the fact-finder to reach a different conclusion” on admissibility.⁸⁰ The new research raised serious doubt about the forensic science that was not available at the original trial. Therefore, the petition for post-conviction relief was granted.⁸¹

SAMPLE HOW ONE JURISDICTION IS HANDLING THE PROBLEM

Increased challenges behind the scientific basis of bite mark evidence are being advanced around the United States. Pennsylvania is being offered as a sample jurisdiction in order to offer a glimpse into how the courts are reacting.

Pennsylvania courts have traditionally adopted a remarkably lenient, even cavalier, attitude toward bite mark testimony. In the horrific rape/murder case of *Commonwealth v. Henry*, which went to the Pennsylvania Supreme Court on two occasions, the Court twice upheld use of quite extraordinary bite mark testimony.⁸² In *Henry*, the defendant did not deny that he had inflicted the bite marks on the victim’s face. Rather, the issue centered on the state’s expert dentist’s testimony that “the bite marks were attacking or sadistic in nature.”⁸³ The expert testified that, “he was able to distinguish lunatic and fighting bite marks from attacking or sadistic bite marks and from sexually oriented bite marks.”⁸⁴ In a 1990 decision proving the old adage that bad facts make bad law, the Pennsylvania Supreme Court found no error in allowing this testimony to go to the jury.⁸⁵ The Court opined that:

Pennsylvania has adopted a liberal standard for the qualification of an expert. “Generally, ‘if a witness has any reasonable pretension to specialized knowledge on the subject matter under investigation he may testify and the weight to be given to his evidence is for the jury.’”⁸⁶

In 1997, denying a subsequent petition for post-conviction relief in the same case, the Court backtracked somewhat and held that even if *Henry*’s defense counsel had been deficient in attempting to discredit the state’s expert dentist, *Henry* was not entitled to relief

because he was unable to prove prejudice resulting from the contested testimony.⁸⁷

The following year, Pennsylvania enacted its own Rules of Evidence. Pennsylvania's Rule 702 diverges from Federal Rule 702 and follows Frye rather than Daubert, providing:

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 if:

- (a) the expert's scientific, technical, or other specialized knowledge is beyond that possessed by the average layperson;
- (b) the expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue; and
- (c) the expert's methodology is generally accepted in the relevant field.⁸⁸

Addressing the evidentiary standard in 2003, the Pennsylvania Supreme Court held that "Frye continues to provide the rule for decision in Pennsylvania."⁸⁹ The Court rejected adoption of the Daubert multi-factor analysis, reasoning that:

After careful consideration, we conclude that the Frye rule will continue to be applied in Pennsylvania. In our view, Frye's "general acceptance" test is a proven and workable rule, which when faithfully followed, fairly serves its purpose of assisting the courts in determining when scientific evidence is reliable and should be admitted.⁹⁰

The Court, however, has noted that Frye is not triggered every time a scientific principle is introduced into the courtroom. Rather, the standard is only triggered when the proffered testimony involves novel science.⁹¹ The question as to what constitutes novel scientific evidence has traditionally been determined on a case-by-case basis.⁹²

In 2006, in *Commonwealth v. Weiner*, the defense filed a motion to strike the report and bar the testimony of a forensic odontologist concerning bite mark evidence under Frye.⁹³ The defense claimed that the dentist was not qualified to offer an expert opinion as "to bite mark identification and as to length of time

following infliction of a bite mark until time of death."⁹⁴ The Court of Common Pleas of Fayette County denied the motion and found that odontology is not novel scientific evidence. It went on to note that over 100 cases have allowed the evidence throughout the United States. Therefore, the defense may challenge the expert's testimony on cross-examination, but such an attack goes to the weight of the opinion and not to its admissibility.⁹⁵

At this writing,⁹⁶ the issue of bite mark identification evidence is once again before the courts in Pennsylvania. Paul Aaron Ross was convicted of first degree murder in 2005, but the Superior Court overturned that conviction in 2012 and remanded the case for a new trial.⁹⁷ Ross filed a pretrial motion before the trial court in Blair County to exclude bite mark identification evidence and requested a Frye hearing on the validity of such evidence. By Opinion and Order of March 8, 2017, the trial judge denied the motion. She reasoned that bite mark evidence is not a novel methodology but an existing scientific field and that it is generally accepted in the relevant scientific community of forensic odontologists. "The issue of bite mark evidence in the instant case is best left as a matter of cross-examination of experts in which the jury may accept or reject the evidence." Ross has requested that the court clarify its ruling and specify that it involves controlling questions of law as to which there is substantial ground for difference of opinion, so as to warrant an immediate appeal.⁹⁸ The matter is pending.

CONCLUSION


Will bite mark evidence go the way of such previously widely accepted "scientific" disciplines as "phrenology," the study of the human skull to determine the individual's "faculties" in such areas as "amateness," "philoprogenitiveness" and "eventuality"?⁹⁹ It seems counter-intuitive that the courts continue to admit bite mark evidence after the flurry of studies criticizing the forensic technique as lacking an adequate scientific basis. Precedent, however, is a powerful factor for sticking to established judicial rulings. Whether the recent decisions overturning convictions based upon bite mark evidence are a precursor of things to come remains to be seen. These cases, however, do provide the courts with authority to reverse the long-standing belief that bite mark evidence is admissible and a valid science.

Practice Checklist for the Admissibility of Bite Mark Evidence

Forensic science encompasses many different fields including forensic dentistry which seeks to identify human remains by their teeth or identify a suspect by comparing their dentition with a bite mark found on the victim.

- ❑ The foundation of bite mark evidence is based upon the concept that no two individuals have identical dentition with respect to size, shape and teeth alignment.
- ❑ Critics maintain that while bite mark evidence is alleged to be comparable to DNA with respect to accuracy, there has been no scientific validation for the notion that a person's dentition is unique to him or her in the same way that fingerprints or DNA are unique to each individual.
- ❑ The first step involving bite mark evidence is to determine if the impression was created by a human or an animal. The bite is then reviewed for traces of DNA left by the assailant's saliva. This initial process will be followed by the scientist taking a variety of photographs due to the changing nature of the evidence. The dentists will then obtain measurements of the teeth marks. This is followed by the surgical removal of the bite mark from the skin of a deceased victim, preserving the specimen in formalin and creating a silicon cast of the indentation.
- ❑ The American Board of Forensic Odontology offers board certification to those dentists who perform bite mark identification and the Board is acknowledged by the American Academy of Forensic Science as a forensic specialty.
- ❑ The Guidelines of the American Board of Forensic Odontology do not provide the specific criteria needed for each method, nor do they establish the underlying probability of accuracy.

- ❑ A major objection to bite mark evidence is that it lacks a proper scientific foundation, as it is not premised upon reliable scientific methodology.
- ❑ Several scientific bodies have recently issued statements critical of bite mark evidence. The National Academy of Sciences, the President's Council of Advisors on Science and Technology ("PCAST"), and the Texas Forensic Science Commission are heavily critical of bite mark evidence. Each organization has concluded that bite mark analysis does not meet scientific standards for foundational validity.
- ❑ The Department of Justice, the FBI, prosecutors and forensic dentists reject the criticism levied at bite mark identification. For instance, the Department of Justice has stated that it will ignore the report from the President's Council of Advisors on Science and Technology, and the FBI called the report "erroneous and overbroad."
- ❑ The admissibility of scientific evidence is guided by two different standards commonly known as Frye and Daubert. Frye requires the scientific principle to be generally accepted in the scientific community in which it belongs. Daubert superseded Frye in federal and some state courts. The new standard examines a scientific principle with an eye towards: "testing; peer review and publication; known or expected error rate; operational standards; and acceptance within a relevant scientific community."
- ❑ The lack of scientific accuracy and the various critical studies have made little difference in the courts and bite mark evidence is routinely admitted in most jurisdictions. The growing criticism from the scientific community appears to have largely fallen on deaf ears.

This reluctance to prohibit bite mark identification may be changing as more and more people become aware of the weaknesses in the evidence. Also, courts are starting to recognize that a conviction can be challenged on a due process basis if flawed forensic evidence was used that "undermined the fundamental fairness of the entire trial." 

Notes

1 Nation, Identity and the Fascination with Forensic Science in Sherlock Holmes and CSI, *International Journal of Cultural Studies* 10(3):365-382, September 2007. Portions of this article have been published in Samuel D. Hodge,

Jr. and Alexandra Ewing, *Bite Mark Identification - A Reliable Forensic Tool or Junk Science?*, *Pennsylvania Bar Quarterly*, July 2017 and are reprinted with permission.

- 2 Alex Salamanca, 25 Science “Facts That Were Proven Wrong,” <http://list25.com/25-science-facts-that-were-proven-wrong/> (last visited June 1, 2017).
- 3 The use of teeth to identify a person is an accepted forensic science when the decedent is skeletonized, decomposed, burned, or dismembered. Teeth are virtually indestructible and can withstand heat up to 1600°C without destruction of their microstructure. Anoop Verma et al., Role of Dental Expert in Forensic Odontology, 5 Natl. J. Maxillofac. Surg. 2, 2–5 (2014), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4178350/> (last visited Apr. 4, 2017).
- 4 Anoop Verma et al., Identification of a Person with the Help of Bite Mark Analysis, 3 J. Oral Biol. Craniofac. Res. 2013 88, 88–91, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3941620/> (last visited Apr. 4, 2017) [hereinafter Verma et al., Identification].
- 5 Jim Fisher, Bite Mark Identification: A Forensics Science Losing Its Credibility, Jim Fisher True Crime (Dec. 9, 2015), <http://jimfishertruecrime.blogspot.com/2013/09/bite-mark-identification-forensic.html> (last visited Apr. 4, 2017).
- 6 Verma et al., Identification, supra. Bite mark identification was put on the map with the Ted Bundy case but its use can be traced back to Nero in 66 A.D. The emperor’s mother had the consort of Caligula beheaded. To make sure she was dead, the mother examined the front teeth of the woman and found a discolored tooth that positively identified her. Paul Revere of Revolutionary War fame was actually a dentist and he helped identify soldiers by their dental work. Verma et al., Identification, supra.
- 7 Marjorie A. Shields, Admissibility and Sufficiency of Bite Mark Evidence as Basis for Identification of Accused, 1 A.L.R.6th 657 (Originally published in 2005).
- 8 Mary G. Leary, Proof of Identification of Bite Marks, 75 Am. Jur. Proof of Facts 3d 317 (Originally published in 2003).
- 9 Id.
- 10 Paul C. Giannelli, Bite Mark Analysis, 43 Crim. Law Bull. 930, 930 (2007), <http://www.forensicdentistryonline.org/wp-content/uploads/2011/07/Bite-Mark-Analysis.pdf> (last visited Apr. 4, 2017).
- 11 California Innocence Project, Bite Mark Evidence, <https://californiainnocenceproject.org/issues-we-face/bite-mark-evidence/> (last visited Apr. 4, 2017).
- 12 Shanna Freeman, How Forensic Dentistry Works, How Stuff Works, <http://science.howstuffworks.com/forensic-dentistry3.htm> (last visited Apr. 4, 2017).
- 13 Id.
- 14 Certification, The American Board of Forensics Odontology, <https://abfo.org/membership> (last visited Apr. 4, 2017).
- 15 Nat’l Res. Council of the Nat’l Academies, Strengthening Forensic Science in the United States: A Path Forward 173 (2009) [hereinafter NAS Report].
- 16 Id.
- 17 Paul C. Giannelli, Bite Mark Evidence, 22 Crim. Just. 42, 42 (2007).
- 18 However, a minority of courts have refused to allow bite mark evidence based upon the nature of the evidence. See *Ege v. Yukins*, 380 F.Supp.2d 852 (E.D. Mich. 2005); *Jackson v. State*, 511 So.2d 1047 (Fla. Dist. Ct. App. 1987); *People v. Queen*, 474 N.E.2d 786 (Ill. App. Ct. 1985).
- 19 NAS Report, supra, at 173. The first case to challenge bite mark identification occurred during the Salem Witch Hunts. A preacher was arrested for witchcraft after bite marks were discovered on some young women he was trying to recruit. During his trial, the prosecution opened the preacher’s mouth to compare his teeth to those found on the bodies of several injured ladies in the courtroom. As a result, he was convicted and hanged. Months later, the governor of the state ordered an end to witch trials and expressed his concern that “intangible evidence” was being used improperly in court. Tess Owens, Forensic Experts in Texas Are Calling on Courts to Stop Accepting Bite-Mark Evidence, Vice News (Feb. 12, 2016), <https://news.vice.com/article/forensic-experts-in-texas-are-calling-on-courts-to-stop-accepting-bite-mark-evidence> (last visited Apr. 4, 2017).
- 20 NAS Report, supra, at 174.
- 21 President’s Council of Advisors on Sci. & Tech., Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods 85–86 (Sept. 2016), https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/PCAST/pcast_forensic_science_report_final.pdf [hereinafter PCAST Report].
- 22 Erica Beecher-Monas, Reality Bites: The Illusion of Science in Bite-Mark Evidence, 30 Cardozo L. Rev. 1369, 1383–84 (2009).
- 23 NAS Report, supra, at 174, 176.
- 24 Id. at 176.
- 25 Id.; PCAST Report, supra, at 83–84.
- 26 PCAST Report, supra note 25, at 85–87 (documenting how multiple studies indicated a false positive rate of up to 16% or roughly 1 in 6, and showing another study had a false positive rate of up to 84%).
- 27 Id. at 83.
- 28 Id. at 85–87.
- 29 NAS Report, supra.
- 30 PCAST Report, supra.
- 31 Texas Forensic Sci. Comm’n, Forensic Bitemark Comparison Complaint Filed by National Innocence Project on Behalf of Steven Mark Chaney – Final Report (Apr. 12, 2016), <http://www.fsc.texas.gov/sites/default/files/FinalBiteMarkReport.pdf> [hereinafter Texas Forensic Sci. Comm’n Final Report].
- 32 NAS Report supra, at 176; PCAST Report, supra, at 87; Texas Forensic Sci. Comm’n Final Report, supra, at 15–16.
- 33 Radley Balko, The Path Forward on Bite Mark Matching – And the Rearview Mirror, Wash. Post (Feb. 20, 2015), https://www.washingtonpost.com/news/the-watch/wp/2015/02/20/the-path-forward-on-bite-mark-matching-and-the-rearview-mirror/?utm_term=.b239e8c6a323. For instance, the report expressed a series of concerns: “Bite marks on the skin will change over time; bite marks can be distorted by the elasticity of the skin, the unevenness of the surface bite, and swelling and healing; distortions in photographs and changes over time in the dentition of suspects, may limit the accuracy of the results; different experts provide widely differing results and a high percentage of false positive matches of bite marks using controlled comparison studies; and concerns about a lack of supporting research, a lack of a central repository of bite marks and patterns, and the potential for examiner bias.” Forensic Odontology – Bite Mark Comparison, Forensic Resources,

- <http://www.ncids.com/forensic/bitemark/bitemark.shtml> (last visited Apr. 4, 2017).
- 34 Texas Forensic Sci. Comm'n Final Report, *supra*, at 15–16.
- 35 Michael Sacks et al., Forensic Bite-mark Identification: Weak Foundations, Exaggerated Claims, 3 J. Law Biosci. 538 (2016).
- 36 *Id.*
- 37 Mary Bush, Peter Bush & H. David Sheets, Statistical Evidence for the Similarity of the Human Dentition, 56 J. Forensic Sci. 118, 118–23 (2011).
- 38 Oxford University Press, Experts Argue It's Time to Stop Using Bite Marks in Forensics, Forensic Mag. (Dec. 1, 2016, 11:43 AM), <http://www.forensicmag.com/news/2016/12/experts-argue-its-time-stop-using-bite-marks-forensics> (last visited Apr. 4, 2017).
- 39 Jordan Smith, FBI and DOJ Vow to Continue Using Junk Science Rejected by White House Report, The Intercept (Sept. 23, 2016, 2:10 PM), <https://theintercept.com/2016/09/23/fbi-and-doj-vow-to-continue-using-junk-science-rejected-by-white-house-report/> (last visit Apr. 4, 2017).
- 40 *Id.*
- 41 Frye v. United States, 293 F. 1013, 1014 (D.C. Cir. 1923).
- 42 *Id.* at 1014.
- 43 Pub. L. 93-595, § 1, Jan. 2, 1975, 88 Stat. 1937.
- 44 The current version of Federal Rule 702 provides:
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 if:
(a) the expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue;
(b) the testimony is based on sufficient facts or data;
(c) the testimony is the product of reliable principles and methods; and
(d) the expert has reliably applied the principles and methods to the facts of the case.
FRE 702, 28 U.S.C.A.
- 45 Daubert v. Merrell Dow Pharmaceuticals, 113 S. Ct. 2786, 2793 (1993).
- 46 *Id.* at 2794.
- 47 *Id.* at 2795.
- 48 *Id.* at 2796.
- 49 *Id.*
- 50 *Id.* at 2797.
- 51 *Id.*
- 52 *Id.* (citations omitted). In a subsequent decision, the Court adopted a fairly lenient abuse-of-discretion standard for review of a lower court's ruling on the admissibility of expert testimony. General Electric v. Joiner, 118 S.Ct. 512 (1997).
- 53 See Shields, *supra*. See also Sarah Lucy Cooper, The Collision of Law & Science: American Court Responses to Developments in Forensic Science, 33 Pace L. Rev. 234, 251 (2013).
- 54 See Cooper, *supra*, at 293.
- 55 Ege v. Yukins, 485 F.3d 364, 376 (6th Cir. 2007).
- 56 See Innocence Project, Description of Bite Mark Exonerations, https://www.innocenceproject.org/wp-content/uploads/2016/07/Description-of-Bite-Mark-Exonerations-as-of-July-2016_final.pdf (last visited Apr. 4, 2017).
- 57 Coronado v. State, 384 S.W.3d 919, 927 (Tex. App. 2012).
- 58 *Id.* at 928.
- 59 Findings of Fact, Conclusions of Law, Memorandum & Order, No. 31CR143043, 2015 WL 12516622 (Minn. Dist. Ct. 2015).
- 60 *Id.* at *4.
- 61 These comments are based upon email exchanges with Professor Natali and the authors on March 3, 2017.
- 62 Radley Balko, Opinion, Another Judge Rules in Favor of Bite Mark Evidence, For the Same Misguided Reasons, Wash. Post (Mar. 16, 2017), https://www.washingtonpost.com/news/the-watch/wp/2017/03/16/another-judge-rules-in-favor-of-bite-mark-evidence-for-the-same-misguided-reasons/?utm_term=.0ed326631499 (last visited Apr. 4, 2017).
- 63 *Id.*
- 64 *Id.*
- 65 Order Denying Def.'s Motion in Limine, No. 2010CF012600, 2015 WL 10384608 (Fla. Cir. Ct. 2015).
- 66 *Id.* at *1.
- 67 *Id.* at *4.
- 68 *Id.* See State v. Temple, 273 S.E.2d 273, 279–80 (N.C. 1981); People v. Bethune, 484 N.Y.S.2d 577, 581 (N.Y. App. Div. 1984); People v. Marsh, 441 N.W.2d 33, 34 (Mich. Ct. App. 1989); Spence v. State, 795 S.W.2d 743, 752 (Tex. Crim. App. 1990).
- 69 Gimenez v. Ochoa, 821 F.3d 1136, 1144 (9th Cir. 2016); Albrecht v. Horn, 485 F.3d 103, 124 n.7 (3d Cir. 2007).
- 70 No. 12-06995-JVS (DFM), 2014 WL 1779492 (C.D. Calif. May 5, 2014).
- 71 *Id.* at *11.
- 72 *Id.*
- 73 371 P.3d 195 (Cal. 2016).
- 74 In re Richards, 371 P.3d at 208.
- 75 *Id.* at 208. Part of the reason the case was reversed is that the state legislature enacted the Bill Richard Bill that allows convictions to be reversed when an expert recants his or her testimony or when the foundation underlying the original testimony has changed. Jordan Smith, California Supreme Court Overturns Murder Conviction Based on Flawed Bite-Mark Evidence, The Intercept (May 27, 2016, 9:15 AM), <https://theintercept.com/2016/05/27/california-supreme-court-overturns-bill-richardss-murder-conviction-based-on-flawed-bite-mark-evidence/> (last visited Apr. 4, 2017).
- 76 Sarah Kaplan, "Texas inmate's 1989 conviction overturned after bite mark evidence discredited," Washington Post, Oct. 13, 2015, available at: https://www.washingtonpost.com/news/morning-mix/wp/2015/10/13/texas-mans-conviction-overturned-after-bite-mark-evidence-discredited/?utm_term=.a84626667429 (last visited Apr. 24, 2017).
- 77 *Id.*
- 78 *Id.*
- 79 Order on Def.'s Petition for Post-Conviction Relief, No. 1998-02-0463, 2013 WL 658266 (Ohio Com. Pl. Jan. 29, 2013). In Coleman v. Nevada, 385 P.3d 604 (Table), 2016 WL 6916195 (Nev. Nov. 23, 2016), the dissenting judge talked about bite mark evidence and said: "The science behind bite-mark testimony is murky at best. The underlying theory, that a *mark* found on a dead victim can be traced to the dentition of the perpetrator, is dubious. The uniqueness of human

- dentition is questionable, and there is little empirical support for such a proposition." *Id.* at *10.
- 80 Order, Prade, 2013 WL 658266, at *7.
- 81 *Id.* at *13–14.
- 82 Commonwealth v. Henry, 569 A.2d 929 (Pa. 1990); *aff'd* denial of post-conviction relief 706 A.2d 313 (Pa. 1997).
- 83 Henry, *supra*, 569 A.2d at 934.
- 84 *Id.* The testimony suggests multiple dental and metaphysical issues. Do "lunatics" really have or leave different tooth patterns than, for lack of a better term, "non-lunatics?" How exactly is a fighting bite mark different from an attacking bite mark? What if a "lunatic" bites someone in a sexual manner, or are "lunatics" incapable of sexual arousal? The list could go on.
- 85 Henry, *supra*, 569 A.2d at 935.
- 86 *Id.* at 934.
- 87 Henry, *supra*, 706 A.2d at 326-7.
- 88 Pa. Rules of Evidence, Rule 702, adopted May 8, 1998, effective Oct. 1, 1998.
- 89 Grady v. Frito-Lay, 839 A.2d 1038 (Pa. 2003).
- 90 *Id.* at 1044.
- 91 Commonwealth v. Delbridge, 580 Pa. 68, 859 A.2d 1254, 1260 (Pa. 2004).
- 92 See Commonwealth v. Dengler, 586 Pa. 54, 890 A.2d 372 (Pa. 2005).
- 93 Commonwealth v. Weiner, 2006 WL 5507636 (CP Fayette) (Trial Order).
- 94 *Id.*
- 95 *Id.*
- 96 June 2017.
- 97 Commonwealth v. Ross, CP Blair, CR 2038-2004, Opinion and Order, March 8, 2017.
- 98 *Id.* Defendant's Motion to Amend Order of March 8, 2017.
- 99 See Pierre Schlag, Commentary: Law and Phrenology, 110 Harvard L. Rev. 877 (1997).