

SUPREME COURT OF NORTH CAROLINA

STATE OF NORTH CAROLINA,)
)
 Plaintiff-Appellee,)
)
 v.)
)
 JONATHAN RICHARDSON,)
)
 Defendant-Appellant.)

From Johnston County
 Nos. 10CRS54426, 10CRS54369,
 10CRS3981-82

BRIEF OF AMICI CURIAE INNOCENCE PROJECT, INC.
AND THE WILSON CENTER FOR SCIENCE AND JUSTICE

SUPREME COURT OF NORTH CAROLINA

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BRIEF OF AMICI CURIAE¹

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¹ The full roster of *amici curiae* are listed in the Motion for Leave to File Amicus Curiae Brief. The views expressed herein reflect those of Professor Brandon L. Garrett, the Wilson Center for Science and Justice, and the Innocence Project, but not those of any academic institution to which they belong, such as Duke University. No person or entity—other than *amici curiae*, their members, or their counsel—directly or indirectly wrote this brief or contributed money for its preparation.

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INTRODUCTION

As our justice system becomes more dependent on the proper application of forensic science methods, courts play an increasingly crucial role in ensuring that only valid, reliable expert testimony is admitted. To protect the integrity of both individual judicial proceedings and the broader justice system, courts must exclude forensic testimony that lacks a solid scientific foundation. That obligation is no less important in cases with disturbing facts, or in cases involving the most serious offenses.

This case involved horrifying injuries inflicted upon a four-year-old child, who died and almost certainly suffered tremendously beforehand. The defendant was convicted of first-degree murder and sentenced to death. Yet, the gruesomeness of this crime does not relieve the court of its evidentiary gatekeeping role, which the trial court failed to properly perform here.

On the contrary, the trial court abdicated its gatekeeping role and improperly admitted inherently unreliable and unscientific testimony from Dr. Richard Barbaro that bite marks on the victim were made by the defendant. Under either the version of Rule 702 of the North Carolina Rules of Evidence that was in force at the time the defendant was indicted, or the post-2011 version of that Rule adopting standards drawn from *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993), this testimony fails to pass muster and should have been excluded as lacking sufficient reliability or scientific foundation.

As for the first category of improperly admitted testimony, the near-unanimous consensus of the scientific community today is that bite-mark testimony, which purports to identify an alleged “biter” who produced bite marks on a victim, lacks scientific foundation, is inherently unreliable, and should not be admissible in any case. To date, analogous bite-mark comparison testimony that incorrectly associated a defendant with a bite mark has contributed to the wrongful convictions and indictments of more than 30 individuals, who collectively served over 300 years in prison for

crimes that they did not commit. *See* Ex. A. Leading scientists and scientific groups have condemned bite-mark analysis as wholly lacking any valid scientific foundation. It cannot and should not be admitted as a form of expertise under Rule 702.

Yet, that is precisely the sort of testimony that was admitted in this case. According to Dr. Barbaro’s initial expert report, he “believe[d] with a high level of confidence [] that Jonathan Douglas Richardson made the bite marks.” Ex. B at 5612; *see also id.* at 5687 (“I truly believe that there’s a high scientific consistency to the victim’s bite marks and the suspect’s dentition.”) (emphasis added). But there is no “scientific” basis for such testimony—no empirical support for the premise that a patterned injury can be consistently and correctly identified as a bite mark, nor any empirical support for the premise that the individual who inflicted that injury (or could have inflicted that injury) can be consistently and correctly identified.

We do not address whether any of the foregoing errors was harmful or reversible. Instead, we write to emphasize the importance of clarifying that under Rule 702, the expert testimony in question was not properly admitted because it lacked any scientific foundation. Accordingly, we support the Defendant-Appellant's motion to exclude that testimony, and urge the court to declare that this type of speculative and unscientific testimony is inadmissible.

ARGUMENT

I. NORTH CAROLINA COURTS MUST EXCLUDE UNRELIABLE EXPERT TESTIMONY UNDER RULE 702

The North Carolina courts serve a vital function in excluding unreliable forensic testimony from the courtroom. This critical gatekeeping role has long been enshrined in Rule 702 of the North Carolina Rules of Evidence. Prior to 2011, Rule 702 provided that “[i]f 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.” *State v. Goode*, 341 N.C. 513, 527 (1995) (quoting Rule 702). Under that Rule, trial courts applied a three-step inquiry to evaluate the admissibility of expert testimony:

- (1) Is the expert’s proffered method of proof sufficiently reliable as an area for expert testimony?
- (2) Is the witness testifying at trial qualified as an expert in that area of testimony?
- (3) Is the expert’s testimony relevant?

Id. at 639–41. As the North Carolina Supreme Court has explained, “reliability is thus a preliminary, foundational inquiry into the basic methodological adequacy of an area of expert testimony.” *Howerton v. Arai Helmet, Ltd.*, 358 N.C. 440, 460 (2004). Indeed, “the requirement of reliability is nothing new to the law of scientific and technical evidence in North Carolina and, indeed, pre-dates the federal court’s adoption of the *Daubert* standard.”² *Id.* at 459; *see also State v. Pennington*, 327 N.C. 89, 98 (1990) (“A new scientific method of proof is admissible at trial if the method is sufficiently reliable.”); *State v. Bullard*, 312 N.C. 129, 149–53 (1984) (discussing factors relevant in determining whether scientific methods in their infancy are reliable); *State v. Crowder*, 285 N.C. 42, 53 (1974) (expert testimony based on scientific tests “competent only when shown to be reliable”), *vacated in part on other grounds*, 428 U.S. 903 (1976).

The trial court’s gatekeeping role is of the utmost importance to the integrity of North Carolina’s criminal justice system because criminal convictions, where a person’s life and liberty are on the line, should not be based on expert testimony unless that testimony is sufficiently reliable

² During its 2011 session, the General Assembly amended N.C. R. Evid. 702(a). The amended rule implements the standards set forth in *Daubert v. Merrell Dow*. *See State v. McGrady*, 753 S. E. 2d 361, 367 (N.C. Ct. App. 2014). However, the amended version applies only to actions arising on or after October 1, 2011. *See* 2011 N. C. Sess. Law 2011-317 § 1.1.

and has an established scientific foundation. When it lacks such a foundation, courts must exclude proffered expert evidence—indeed, testimony lacking scientific foundation is not even properly characterized as “expert” testimony or as the product of “expertise.” Indeed, under the pre-2011 version of Rule 702, this Court has recognized several scientific theories and techniques as “inherently unreliable and thus generally inadmissible as evidence.” *Howerton*, 358 N.C. at 460 (citing *State v. Peoples*, 311 N.C. 515, 533 (1984) (holding that “hypnosis has not reached a level of scientific acceptance which justifies its use for courtroom purposes”); *State v. Grier*, 307 N.C. 628, 645 (1983) (holding that polygraphs are inadmissible in any trial, even if otherwise stipulated to by the parties)).

II. BITE-MARK COMPARISON TESTIMONY SHOULD BE INADMISSIBLE UNDER RULE 702 DUE TO ITS LACK OF SCIENTIFIC SUPPORT

A. The Relevant Scientific Community Has Rejected Bite-Mark Comparison Testimony As Inherently Unreliable

Testimony that purports to identify a patterned injury as a bite-mark, and/or identify the “biter” who produced that injury (hereinafter “bite-mark comparison testimony”), has been determined to be inherently unreliable in at least three comprehensive scientific reports, each more emphatic than the last in its conclusions:

- The 2009 Report by the Committee on Identifying the Needs of the Forensic Science Community National Research Council, entitled *Strengthening Forensic Science in the United States: A Path Forward* (hereinafter, “the NAS Report”)³;
- The 2016 Report of the Texas Forensic Science Commission (“TFSC”)⁴; and

³ Available at <https://www.ncjrs.gov/pdffiles1/nij/grants/228091.pdf>.

⁴ Tex. Forensic Sci. Comm’n, *Forensic Bitemark Comparison Complaint Filed by National Innocence Project on Behalf of Steven Mark Chaney—Final Report* (2016) (hereinafter “TFSC Report”), <http://www.txcourts.gov/media/1440871/finalbitemarkreport.pdf>.

- The 2016 Report by the Presidential Council of Advisors on Science and Technology (“PCAST Report”)⁵.

The 2009 NAS Report was the first independent examination of the validity and reliability of the alleged scientific foundations for bite-mark comparison testimony by a neutral committee of scientists, and represents the culmination of nearly four years of work.⁶ This authoritative and groundbreaking report demonstrated the lack of biological, statistical, and epistemological foundation for bite-mark comparison testimony. Although the NAS Report discussed numerous forensic fields, no other subject received criticism as scathing, with the NAS concluding that:

(1) The ability of human dentition, if unique, to transfer a unique pattern to human skin and the ability of the skin to maintain that uniqueness has not been scientifically established.

(2) A standard for the type, quality, and number of individual characteristics required to indicate that a bite mark has reached a threshold of evidentiary value has not been established.

NAS Report at 175-76. The NAS Report further found that no scientifically valid studies had ever been conducted to determine what aspects of the teeth and bite mark should be measured to make any such comparisons, and that “there is no established science indicating what percentage of the population or subgroup of the population could also have produced the bite.” *Id.* at 174. As such, testimony purporting to identify a probable match between a biter and a bite mark has “inherent weaknesses” and “basic problems” which have “led to questioning of the value and scientific objectivity” of the discipline. *Id.* at 174, 176.

⁵ See President’s Council of Advisors on Sci. & Tech., *Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods* (2016), https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/PCAST/pcast_forensic_science_report_final.pdf.

⁶ Before issuing its report, the NAS heard extensive testimony from a vast array of scientists, law enforcement officials, medical examiners, crime laboratory officials, investigators, attorneys and leaders of professional and standard-setting organizations, including the American Board of Forensic Odontology, and conducted an extensive review of bite-mark literature and research.

Seven years after the NAS Report (and two years after the trial in this case), a blue-ribbon panel of scientists and lawyers from the TFSC formally recommended a moratorium on admitting bite-mark comparison testimony in all Texas criminal cases. TFSC Report, at 15-16. The TFSC found that although bite-mark comparison evidence had been admitted in Texas criminal proceedings for years, there is no scientific basis for continuing to admit such evidence. *Id.* at 11-12. The TFSC was particularly troubled by a 2014 American Board of Forensic Odontology (“ABFO”) study, discussed further below, that highlighted the “inability of ABFO Diplomates to agree on the threshold question of whether a patterned injury constitutes a human bitemark.” *Id.* at 13. After considering the relevant evidence, the TFSC made two “threshold observations that should be universally accepted among forensic odontologists and stakeholders in the broader criminal justice community.” *Id.* at 11. First, “there is no scientific basis for stating that a particular patterned injury can be associated to an individual’s dentition,” as Dr. Barbaro purported to do. *Id.* at 11-12. Second, there is “no scientific basis for assigning probability or statistical weight to an association [of a bite mark to a biter],” despite the fact that “these types of claims were once thought to be acceptable.” *Id.* at 12.

In 2016, the PCAST, an advisory group of the nation’s leading scientists and engineers,⁷ conducted an “extensive literature review” of more than 2,000 articles, papers, and other relevant literature, and heard testimony from across the spectrum of the forensic science community. PCAST Report at x, 2. Like the NAS and the TFSC before it, the PCAST found that what little research has been done on bite marks “cast[s] serious doubt on the fundamental premises of the

⁷ The PCAST was a 19-member advisory group of the Nation’s leading scientists and engineers appointed by the President to augment the science and technology advice available to him from inside the White House and from cabinet departments and other Federal agencies. Their membership included academics, scientists, government employees, and private practitioners.

field,” and demonstrates that “forensic odontologists do not consistently agree even on whether an injury is a human bite mark at all.” *Id.* at 83-85. Indeed, the PCAST concluded that “the available scientific evidence strongly suggests that examiners cannot consistently agree on whether an injury is a human bite mark,” and that “the prospects of developing bite mark analysis into a scientifically valid method [are too] low” to justify “devoting significant resources to such efforts.” *Id.* at 9.

The wholesale repudiation of bite-mark comparison testimony has been echoed by dozens of prominent scientists, statisticians, and law-and-science scholars or practitioners, who have publicly stated that bite-mark comparison evidence “stands on a foundation of very thin scientific support—if any at all.” *See* Ex. D. The trial court also ignored the fact that even within the forensic odontology community there is considerable dissent; many high-profile forensic dentists who were once ardent advocates for and defenders of bite-mark comparison testimony now reject its use in criminal cases. *See* Ex. E. In short, the overwhelming majority of the relevant scientific community has affirmatively rejected the validity of bite-mark comparison testimony. The lack of even a single study showing that accurate, positive associations between a putative biter and injury confirms that this field is unreliable, and testimony purporting to identify an injury as a bite mark, or an individual as the source of that mark, should be excluded.

B. Dr. Barbaro’s Testimony Was Unreliable

1. *There is No Scientific Basis for Dr. Barbaro’s Identification of Injuries on the Victim as Bite Marks*

Bite-mark comparison testimony depends on the notion that practitioners can reliably determine that an injury was caused by a bite (and can differentiate it from other injuries). This purported skill has never been scientifically demonstrated; on the contrary, multiple studies have affirmatively established that practitioners are unable to identify when a patterned injury on a

victim has been caused by a bite. That fact alone should be dispositive under the Rule 702 analysis, meaning that Dr. Barbaro’s testimony should have been excluded on that basis.

Neither Dr. Barbaro, who lacked any prior experience in forensic dentistry, nor even the most experienced forensic dentists, have the ability to consistently make even the most preliminary determination of whether an injury is a bite mark. The ABFO conducted a comprehensive examination in 2014 (“the 2014 Study”) that establishes that even the most experienced forensic odontologists are incapable of reaching consensus on the threshold question of whether an injury is a bite mark—without even reaching the question of whether injuries can be *accurately* identified as bite marks. In the 2014 Study, two researchers, in consultation with the ABFO, gave photos of 100 patterned injuries to 38 ABFO-certified diplomates (with an average of *20 years of experience*), then asked them to answer three questions.⁸

First, the ABFO diplomates were asked “[i]s there sufficient evidence in the presented materials to render an opinion on whether the patterned injury is a human bite mark?” The participants unanimously agreed on *just 4 of the 100 case studies*. In other words, for 96% of the bite-mark samples, the diplomates disagreed on whether there was even sufficient evidence to render an opinion about whether the injury was a bite mark (as opposed to another type of injury).⁹

Second, they were asked “[i]s it a human bite mark, not a human bite mark, or suggestive of such a mark?” There was substantial disagreement on this basic question as well—there were only 16 of 100 cases in which 90 percent or more of the analysts were still in agreement. For

⁸ See PCAST Report at 84-85 (citing Adam Freeman & Iain Pretty, “Construct validity of bitemark assessments using the ABFO decision tree,” (2016), *available at* www.wsj.com/public/resources/documents/ConstructValidBMdecisiontreePRETTYFREEMAN.pdf); Radley Balko, *A Bite Mark Matching Advocacy Group Just Conducted a Study that Discredits Bite Mark Evidence*, Wash. Post, Apr. 8, 2015, <https://www.washingtonpost.com/news/the-watch/wp/2015/04/08/a-bite-mark-matching-advocacy-group-just-conducted-a-study-that-discredits-bite-mark-evidence/>.

⁹ Balko, *supra* n. 8.

84 of the patterned injuries that the ABFO experts were shown, there was substantial disagreement as to whether the injury at issue was even a bite-mark.¹⁰

Third, they were asked “[d]oes the injury have distinct, identifiable arches and individual tooth marks?” By this point, the participants were in complete disagreement—*there were just 8 out of 100 case studies for which at least 90 percent of the analysts were still in agreement.*¹¹

A forensic method of comparison is reliable only if, as a threshold matter, when presented with the same evidence, examiners of similar training and experience—in this case those who have passed the ABFO exam and met the other qualifications for Diplomate status—reach the same conclusions. In the 2014 Study, none of the 100 case studies resulted in unanimous agreement; only 8% of the cases obtained even 90% agreement among the examiners.¹²

The 2014 Study thus exposes fundamental problems with bite-mark comparison testimony that go substantially beyond those identified by the NAS, TFSC, and PCAST. Put simply, the research demonstrates that even experienced, board-certified forensic dentists cannot reliably answer the threshold inquiry necessary to offer bite-mark comparison testimony: whether the injury at issue is or is not a bitemark—to say nothing of associating any particular injury with any particular individual.

The inherent unreliability of bite-mark comparison testimony is attributable in part to this field’s lack of standards that are clear, objective, and grounded in any body of reliable research. There are no standards for defining what constitutes a bite mark, for determining how to exclude or include an individual as the source of a particular mark, or for how much detail an injury must

¹⁰ *Id.*

¹¹ *Id.*

¹² *Id.*

have to be of sufficient evidentiary quality. This lack of standards necessarily runs afoul of the requirements of Rule 702, as it deprives this technique of any reliable foundation.

Another study published in May 2013 likewise documents the extreme unreliability of bite-mark analysis. In that study, 15 Australian forensic odontologists were asked to analyze six images of potential bite marks. The results were similar to the 2014 Study, in that their conclusions as to whether these injuries were in fact bite marks were “highly variable.”¹³ The 2013 study concluded that “[w]hile most odontologists would suggest they can determine with a reasonable degree of certainty what is and what is not a bite mark, there is little evidence to support this claim.”¹⁴ This lack of consensus on the question of whether the injuries were even bite marks exemplifies the “*fundamental flaw* in the methodology of bite-mark analysis and should lead to concerns regarding the reliability of any conclusions reached about matching such a bitemark to a dentition.”¹⁵ Thus, the ability of experts to accurately identify a bite mark is not just unproven; that notion has been affirmatively *disproven*.

2. *There is No Scientific Basis for Dr. Barbaro’s Assumption That Dentition Is Unique*

Throughout his testimony, Dr. Barbaro concluded that “unique and individual characteristics” could be observed in the defendant’s dentition. Ex. B at 5688. Dr. Barbaro was also asked whether he assumes that teeth are “unique” and leave “unique” impressions on skin. Dr. Barbaro testified that there are “individual characteristics that lend themselves to comparison with a suspect.” *Id.* at 10661. This testimony is flatly contradicted by the NAS Report, and Dr. Barbaro himself admitted that there are no studies that demonstrate that an individual’s teeth can

¹³ Mark Page et al., *Expert Interpretation of Bitemark Injuries—A Contemporary Qualitative Study*, 58 J. Forensic Sci. 664, 664 (2013).

¹⁴ *Id.* at 671.

¹⁵ *Id.* (emphasis added).

create unique patterned injuries. *Id.* at 10663. Nevertheless, Dr. Barbaro insisted—without any empirical evidence—that certain features of teeth are “unique and individual.”

3. *There is No Scientific Basis for Dr. Barbaro’s Assumption That He Can Accurately Identify The Source of a Patterned Injury*

Dr. Barbaro stated in his initial report: “I believe with a high level of confidence that Jonathan Douglas Richardson made the bite marks.” Ex. B at 5612. As the NAS Report found, there is no valid scientific method of reaching such a conclusion. Dr. Barbaro was asked directly about the NAS Report at trial. Ex. C at 10656. He responded that while distortion and other factors can alter bite marks, “in context, I think in this case I’ve proven to the Court that there was a high degree of consistency between the bite mark evidence here comparing the suspect to the victim.” *Id.* at 10659. But substantial research conclusively establishes that no one is capable of identifying “a high degree of consistency between [a] bite mark” and the suspect’s teeth.

For instance, the NAS Report concluded that “[e]ven when using the [ABFO] guidelines, different experts provide widely differing results and a high percentage of false positive matches of bite marks using controlled comparison studies.” NAS Report at 174. Numerous other studies confirm that in this field, false positives (and wrongful convictions) are pervasive. *See, e.g.,* C. Michael Bowers, *Problem-Based Analysis of Bitemark Misidentifications: The Role of DNA*, 159S *Forensic Sci. Int’l* S104, S107 (2006). For instance, in 1999, a workshop “where ABFO diplomates attempted to match four bitemarks to seven dental models” resulted in “63.5% false positives.” *See id.* at S106. Similarly, a 2001 study of “bites made in pig skin, ‘widely accepted as an accurate analogue of human skin,’” resulted in 11.9-22.0% “false positive identifications.” *Id.*

Dr. Barbaro acknowledged that “the error rate in bite mark analysis is reported in some of the literature to be as high as sixty-three percent,” and claimed that there is “no statistical value”

for bite-mark comparison evidence. Ex. B at 5704, 5726. Perhaps for these reasons, Dr. Barbaro opined that “any case that was based solely, solely and totally on bite mark evidence should be overturned,” noting that courts had reversed the convictions in several cases. *Id.* at 5709. In spite of all this, Dr. Barbaro stuck to his personal belief that the defendant caused the bite marks, claiming that his work in a family dental practice somehow provided him with sufficient expertise to reach that conclusion: “I’ve been doing this for 30 years. I examined thousands and thousands of teeth. And so I know my teeth. . . .” *Id.* at 10649.

Moreover, there is no dispute that skin is an unreliable medium for recording bite marks. That is, the way an alleged bite mark appears when it was photographed does not reflect the way the injury appeared when inflicted; nor will the injury look the same as it decomposes. As a result, a dentition may “match” a purported bite mark one day, and not the next, due to decomposition or healing of the injury.¹⁶ Moreover, as Dr. Barbaro himself noted, “bite marks are dynamic” because “the person who’s making the bite is moving” and “the person who’s receiving the bite is moving.” Ex. C at 10565.

Peer-reviewed scientific research also corroborates that because of the inherent variability of skin (and numerous other factors), bite marks from the same dentition may appear substantially different; by that same token, dentitions may appear to best match marks they did *not* create.¹⁷ This means that Dr. Barbaro’s testimony is based on a perfect recipe for false identifications of injuries as bite marks, and false attributions of those marks to criminal defendants. Thus, even

¹⁶ See, e.g., Michael J. Saks et al., *Forensic Bitemark Identification: Weak Foundations, Exaggerated Claims*, 3 J.L. & Biosciences 538, 12 (2016) (attached as Ex. F).

¹⁷ See, e.g., Raymond G. Miller et al., *Uniqueness of the Dentition as Impressed in Human Skin: A Cadaver Model*, 54 J. Forensic Sci. 909 (2009); Mary A. Bush et al., *Biomechanical Factors in Human Dermal Bitemarks in a Cadaver Model*, 54 J. Forensic Sci. 167 (2009); Mary A. Bush et al., *A Study of Multiple Bitemarks Inflicted in Human Skin by a Single Dentition Using Geometric Morphometric Analysis*, 211 Forensic Sci. Int’l 1 (2011).

assuming the human dentition is distinct, such “uniqueness” cannot be faithfully recorded in human skin, and thus Dr. Barbaro’s testimony that the defendant’s dentition was consistent with that of the patterned injuries on the victim is unreliable.

4. *Dr. Barbaro’s Testimony Was Unreliable Because of His Lack of Expertise And Biased Approach*

Rather than being a true expert in the field of bite-mark analysis—a field with no basis in science—Dr. Barbaro is more of a hobbyist. In his professional experience, Dr. Barbaro is chiefly occupied with “a busy family [dental] practice,” treating individual patients. *Id.* at 10550. Given the inherent flaws in bite-mark analysis, no amount of experience or board-certification can transform speculation into reliable evidence that can be presented by a person that should be qualified to testify as an expert. Even so, Dr. Barbaro was essentially moonlighting as an expert witness in a capital trial. He acknowledged at the hearing that he does “not consider [him]self to be a bite mark expert,” had never testified to a bite mark “match” before, and was not a member of the ABFO. *Id.* at 5684, 5686, 5698. And similar to the ABFO experts, Dr. Barbaro has never taken a proficiency test in forensic dentistry, *id.* at 5704; thus, there is no evidence that he—or anyone else—has any documented ability to perform bite-mark identification or comparison with any measured level of accuracy.

Although there is no proficiency testing, the ABFO’s Standards and Guidelines for Evaluating Bitemarks at least instruct dentists to remain objective in all phases of investigation, analysis, comparison, and reporting of their casework, including by minimizing all forms of bias.¹⁸ Quite the opposite occurred here. Rather than avoiding biasing information, Dr. Barbaro invited it into his analysis. As he admits, whenever he is called upon to assist with cases outside his

¹⁸ Am. Bd. Forensic Odontology, Standards and Guidelines for Evaluating Bitemarks § 2(a)(i) (Feb. 19, 2018), <https://abfo.org/resources/id-bitemark-guidelines>.

practice, he “always learn[s] as much as [he] can about the history of the case.” Ex. B at 5640. Indeed, Dr. Barbaro actually “Googled the case and found out that Jonathan Richardson was a suspect in a murder case involving the decedent.” *Id.* at 5710. So, before he concluded that the defendant caused the bite marks, Dr. Barbaro “already knew that he was a suspect and that [Taylor] was the decedent.” *Id.* Dr. Barbaro never saw himself as a neutral, outside expert, but instead considered himself to be “just like any investigator or homicide detective.” *Id.* at 5642. The fact that Dr. Barbaro knew that the defendant was already a suspect in the crime, and was apparently committed to assisting with his prosecution, deprives his analysis of any value.

Dr. Barbaro’s method was further flawed by his failure to compare the evidence to anyone aside from the defendant. *Id.* at 10652. Dr. Barbaro admitted that blind comparisons can be done, but that:

I did no blind comparison other than look at teeth every day in my office during the last three and a half years and saw that every single person that I saw had different bite marks from one another -- different bite characteristics from one another and certainly different from the ones that Jonathan Richardson presents.

Id. at 10654. It is patently not credible that, in his routine family dental practice, Dr. Barbaro obtained bite marks from his patients and then reliably determined that each individual’s “bite characteristics” are unique and able to be faithfully recorded during a bite.

It should deeply trouble this Court that the work done by Dr. Barbaro in this case was admittedly biased. Dr. Barbaro went out of his way to discover and incorporate highly biasing information that would have powerfully influenced his conclusions. He openly testified that “the suspect pool is very small” in the case. *Id.* at 5687. The crime occurred when the victim was in the defendant’s house—which may be powerful circumstantial evidence of guilt, but is irrelevant to the supposed expert work, in which bite marks were to be independently compared with dentition. Such biasing information has been shown in many studies to lead to erroneous

identifications in a variety of disciplines.¹⁹ This is particularly true with techniques like bite-mark analysis, which is *entirely* subjective and thus uniquely vulnerable to the corrupting influence of contextual bias. Indeed, the NAS Report concluded that:

[F]orensic odontology suffers from the potential for large bias among bite mark experts in evaluating a specific bite mark in cases in which police agencies provide the suspects for comparison and a limited number of models from which to choose from in comparing the evidence. Bite marks often are associated with highly sensationalized and prejudicial cases, and there can be a great deal of pressure on the examining expert to match a bite mark to a suspect.

NAS Report 174-75. This critique perfectly describes Dr. Barbaro's testimony and should have led to its exclusion.

Regardless, even the most qualified dentist, gathering evidence with the most scrupulous care, could not have offered the bite-mark comparison testimony admitted in this case because it is scientifically impossible to make a valid association between a bite mark and a possible biter.

III. THE TRIAL COURT FAILED TO CONDUCT THE REQUIRED ANALYSIS UNDER RULE 702

In this case, the trial court summarily found that Dr. Barbaro's expert opinion satisfied pre-2011 Rule 702. Order Denying Def.'s Mot. To Restrict Testimony at 4, *State v. Richardson* (Super. Ct. Mar. 10, 2014) (No. 549) [hereinafter March 10 Order].²⁰ Had the trial court conducted a full Rule 702 analysis as required, and examined whether this field is a sufficiently reliable area for expert testimony, the "bite mark" evidence would have been excluded.

¹⁹ Itiel E. Dror, David Charlton & Ailsa E. Peron, *Contextual Information Renders Experts Vulnerable to Making Erroneous Identifications*, 74 *Forensic Sci. Int'l* 156 (2006).

²⁰ The court held that the amended version of Rule 702 did not apply to this case because the defendant was indicted before the amendment took effect. Nonetheless, the court went on to find that Dr. Barbaro's testimony was admissible even if the current Rule 702 applies. March 10 Order at 3-4. For the reasons discussed, because the bite mark-related evidence and testimony was so fundamentally flawed and fatally unreliable, it was error to allow that testimony regardless of which version of the Rule applies.

Even under the 2011 version of Rule 702, North Carolina trial courts must critically examine the legitimacy of an expert's purported field of expertise as well as that person's qualifications in that field. Yet, the court's Order admitting Dr. Barbaro's testimony focused instead on his experience and training in the field of general dentistry, not whether the particular bite-mark analysis that he performed here was based on reliable principles and methods. The trial court also failed to acknowledge that every scientific organization that has examined bite-mark evidence has rejected its scientific validity. March 10 Order. By ignoring the NAS Report and others, which contain in-depth critiques of the sort of bite-mark analysis offered by Dr. Barbaro, the court failed to engage in the reliability analysis required under Rule 702.

The trial court's March 10 Order cited four purported examples of appellate courts upholding admissibility of expert opinion testimony by a forensic dentist. But none of those decisions held that bite mark analysis is sufficiently reliable under Rule 702. Forty years ago, in *State v. Temple*, 302 N.C. 1 (1981), this Court considered the admissibility of evidence tending to identify an accused by his own bite marks as "an issue of first impression." *Id.* at 11. Without citing any North Carolina Rules of Evidence, and instead borrowing the approach by the California Supreme Court, this Court held that the expert testimony in *Temple* "was based upon established scientific methods, and is admissible as an instrumentality which aids justice in the ascertainment of the truth." *Id.* at 13. Because that ruling was not premised on Rule 702, and was issued well before the field of bite-mark analysis had been scrutinized by the scientific community and courts, it is not controlling here. *State v. Trogon*, 216 N.C. App. 15 (2011), a much more recent (and non-controlling) decision by the Court of Appeals, is similarly unpersuasive. There, the appellate court concluded that it was not prejudicial to admit expert testimony that the defendant caused the bite mark on the victim. *Id.* at 24–25. Because the defendant did not challenge the admissibility

of the expert testimony generally, the appellate court did not have the occasion to conduct its own Rule 702 analysis and evaluate the reliability of the bite-mark identification field. *Id.* at 23. The two other cases cited by the trial court are also inapposite.²¹

In recent years, as the instances of incorrect bite-mark comparisons have mounted, courts have become far more critical of this evidence. *See, e.g., Starks v. City of Waukegan*, 123 F. Supp. 3d 1036, 1051 (N.D. Ill. 2015) (noting that “[t]here appears to be little, if any, scientifically valid data to support the accuracy of bite mark comparison, and the data that does exist is damning”); Order on Pet’r’s Mot. for Evidentiary Hr’g on Mot. for New Trial at 24, *State v. Hill*, Case No. 85-CR-317 (Ohio Ct. Com. Pl. Oct. 3, 2016) (“Although there have been concerns over the years calling into question the reliability of bite-mark evidence, it is only during the period 2013-2016, that forensic odontologists, including Diplomates of [the] ABFO, have almost universally recognized that any expert opinion of bite-mark evidence that purports to identify a specific biter from the open population *is without any scientific basis.*” (emphasis added)); *State v. Roden*, 437 P.3d 1203, 1209 (Or. Ct. App. 2019) (finding that the admission of bite-mark evidence was error where the state’s odontologist could not cite a single peer-reviewed study testing and validating bite mark identification, and in light of “studies highlighting concerns within the scientific community regarding the high rate of error and lack of objective, standardized results in bite mark analysis and identification”); *Commonwealth v. Kunco*, 173 A.3d 817, 824 (Pa. Super. Ct. 2017) (affirming order for post-conviction DNA testing, and noting that “the bite mark evidence, a crucial component of the Commonwealth’s trial evidence, is problematic, if not entirely

²¹ *State v. Green*, 305 N.C. 463 (1982), simply upheld the *Temple* decision from the year before and similarly did not evaluate the admissibility of bite-mark analysis under Rule 702. *Id.* at 471. *State v. Anderson*, 350 N.C. 152 (1998) held only that expert testimony that bite marks matched the defendant was admissible as evidence of prior bad acts, *not* for identification purposes. *Id.* at 174.

incredible”); Opinion and Order Denying “Supplement to Defendant’s Pretrial Motion in Limine: Frye Test — Bite-mark evidence” at 5, *Commonwealth v. Ross*, No. 07-CR-2038-2004 (Pa. Ct. Com. Pl. Mar. 8, 2017) (restricting, prior to trial, any conclusion beyond including or excluding the defendant as a potential source of an alleged bite mark based on ABFO guidelines); *Ex parte Chaney*, 563 S.W.3d 239, 257 (Tex. Crim. App. 2018) (holding that “the body of scientific knowledge underlying the field of bitemark comparisons evolved in a way that discredits almost all the probabilistic bitemark evidence at trial,” and finding the defendant actually innocent in part based on the evolution of the science of bite-mark comparisons). In light of the growing chorus of jurisdictions that have recognized the lack of scientific foundation for bite-mark evidence, it was improper for the trial court to rely on outdated and non-binding precedent.

V. CONCLUSION

The trial court failed to apply the required Rule 702 scrutiny when evaluating the reliability of the proffered expert evidence in this case. As a result, the trial court failed to appreciate that the expert testimony introduced at trial was based on scientifically invalid methods and principles that are not generally accepted, and was thus inadmissible. Even if the court's failure did not constitute harmful error in this case, the long and growing list of wrongful convictions and indictments due to flawed bite-mark evidence shows the dangerous consequences that can result where trial courts neglect their gatekeeping function. As such, it is critical that this Court make clear that such inherently unreliable and widely discredited evidence, together with a trial court wholly failing to follow any version of Rule 702, has no place in the North Carolina courts.

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Respectfully submitted,

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EXHIBIT A

INNOCENCE PROJECT



DESCRIPTION OF BITE MARK EXONERATIONS

- 1. Keith Allen Harward:** Keith Harward was convicted of the September 1982 murder of a man and the rape of his wife. The assailant, who was dressed as a sailor, bit the rape victim's legs multiple times during the commission of the rape. Because of the assailant's uniform, the investigation focused on the sailors aboard a Navy ship dry-docked near the victims' Newport News, Virginia, home. Dentists aboard the ship ran visual screens of the dental records and teeth of between 1,000 and 3,000 officers aboard the ship; though Harward's dentition was initially highlighted for additional screening, a forensic dentist later excluded Harward as the source of the bites. The crime went unsolved for six months, until detectives were notified that Harward was accused of biting his then-girlfriend in a dispute. The Commonwealth then re-submitted wax impressions and dental molds of Harward's dentition to two ABFO board-certified Diplomates, Drs. Lowell Levine and Alvin Kagey, who both concluded that Harward was the source of bite marks on the rape victim. Although the naval and local dentists who conducted the initial screenings had excluded Harward as the source of the bites, in the wake of the ABFO Diplomates' identifications they both changed their opinions. Harward's defense attorneys also sought opinions from two additional forensic dentists prior to his trials, but those experts also concluded that Harward inflicted the bites; in total, six forensic dentists falsely identified Harward as the biter.

At Harward's second trial, Dr. Levine testified that there was "a very, very, very high degree or probability"—so high that it would be a "[p]ractical impossibility"—that anyone other than Harward inflicted the bites on the victim. Similarly, Dr. Kagey testified that Harward was the biter "with all medical certainty" and "that there is just not anyone else that would have this unique dentition." Post-conviction DNA evidence, however, excluded Harward as the source of all biological evidence collected from the victim and the crime scene and identified the person responsible, a sailor who was stationed on Harward's ship at the time of the crime. That man died in an Ohio prison in 2006 while serving time for abduction. On April 7, 2016, Harward was declared innocent by the Virginia Supreme Court, and he walked out of prison the next day, following 34 years of wrongful imprisonment.¹

- 2. Robert Lee Stinson:** Robert Lee Stinson served over 23 years in a Wisconsin prison for the brutal rape and murder of 63-year-old victim Ione Cychosz. The only physical evidence against Stinson at his 1985 trial was the bite mark testimony of two board-certified ABFO Diplomates, Drs. Lowell Thomas Johnson and Raymond Rawson. Dr. Johnson concluded that the bite marks "had

¹ The Innocence Project, *Keith Allen Harward*, available at <http://www.innocenceproject.org/cases/keith-allen-harward/>.

to have been made by teeth identical" to Stinson's and claimed that there was "no margin for error" in his conclusion. Dr. Rawson, the chairman of the Bite Mark Standards Committee of the ABFO, testified that the bite mark evidence was "high quality" and "overwhelming." Both experts testified "to a reasonable degree of scientific certainty" that the bite marks on the victim had been inflicted at or near the time of death, and that Stinson was the only person who could have inflicted the wounds. After examining Dr. Johnson's workup, Dr. Rawson stated that the methods Dr. Johnson used in gathering the evidence complied with the "standards of the American Board of Forensic Odontology."

The Wisconsin Innocence Project accepted Stinson's case in 2005 and sought DNA testing of saliva and blood-stains on the victim's sweater, which ultimately excluded Stinson. On January 30, 2009, Stinson, then 44, was freed and his conviction was vacated.²

3. **Gerard Richardson:** On December 17, 2013, Gerard Richardson was exonerated after post-conviction DNA testing proved his innocence in a 1994 murder case. He spent nearly 20 years in prison for a crime he did not commit. At Richardson's 1995 trial, ABFO board-certified Diplomate Dr. Ira Titunik testified that a bite mark found on the victim's back "was made by Gerard Richardson . . . there was no question in my mind," and the prosecutor argued that the bite mark was indisputably made by Richardson: "Mr. Richardson, in effect, left a calling card. . . . It's as if he left a note that said, 'I was here,' and signed it because the mark on her back was made by no one else's teeth." There was no other physical evidence tying Richardson to the crime. He was sentenced to 30 years in prison without the possibility of parole. More than 19 years after Monica Reyes was murdered, new evidence demonstrated that Richardson was innocent.³
4. **Willie Jackson:** On May 26, 2006, Willie Jackson was exonerated after post-conviction DNA testing proved his innocence in a 1986 sexual assault case. He had spent 17 years in prison for a crime he did not commit. At Jackson's trial, Dr. Robert Barsley, past president of the American Board of Forensic Odontology (ABFO), told the jury that the bite marks on the victim matched Jackson: "My conclusion is that Mr. Jackson is the person who bit this lady." Ultimately, DNA evidence showed that it was Willie Jackson's brother, Milton Jackson, who attacked and raped the victim.⁴

² The Innocence Project, *Robert Lee Stinson*, available at <http://www.innocenceproject.org/cases/robert-lee-stinson/>; see also *State v. Stinson*, 134 Wis. 2d 224, 397 N.W.2d 136 (Ct. App. 1986).

³ The Innocence Project, *Gerard Richardson*, available at <http://www.innocenceproject.org/cases/gerard-richardson/>; see also http://www.innocenceproject.org/docs/Richardson_Final_Motion_to_Vacate_091713.pdf.

⁴ The Innocence Project, *Willie Jackson*, available at <http://www.innocenceproject.org/cases/willie-jackson/>; see also *Jackson v. Day*, No. Civ. A. 95-1224, 1996 WL 225021, at *1 (E.D. La. May 2, 1996), *rev'd*, 121 F.3d 705 (5th Cir. 1997), and Dr. Barsley's 1989 trial court testimony, available at <http://www.law.virginia.edu/pdf/faculty/garrett/innocence/jackson.pdf>.

5. **Roy Brown:** In January 2007, Roy Brown was exonerated of stabbing and strangling Sabina Kulakowski after spending 15 years in prison. He was convicted of her murder in January 1992 based on bite mark evidence that was the centerpiece of the prosecution's case against Brown. Kulakowski's body had been discovered with multiple bite marks on her back, arm, and thigh, all of which board-certified ABFO Diplomate Dr. Edward Mofson⁵ claimed were a match to Brown's teeth. Mofson testified to a "reasonable degree of dental certainty" that Brown's dentition was "entirely consistent" and "completely consistent" with all of the bite marks, noting that the bite marks depicted the absence of the same two teeth Brown was missing.

Fifteen years after the conviction, however, DNA testing performed on saliva stains left by the perpetrator excluded Brown and matched another suspect, Barry Bench. Nevertheless, citing the prosecution's bite mark evidence at the original trial, which the jury asked to review during deliberations, the judge in the case initially refused to release Brown. Ultimately, in January 2007, the district attorney acknowledged Brown's innocence, and he was exonerated after spending 15 years in prison for a murder he did not commit.⁶

6. **Ray Krone:** On December 31, 1991, Ray Krone was arrested and charged with the murder, kidnapping, and sexual assault of a woman who worked at a bar he frequented. Police had a Styrofoam impression made of Krone's teeth for comparison to bite marks found on the victim's body and, thereafter, he became known in the media as the "Snaggle Tooth Killer" due to his crooked teeth. Dr. Raymond Rawson, a board-certified ABFO Diplomate, testified that the bite marks found on the victim's body matched Krone's teeth. Based on this testimony, Krone was convicted of murder and kidnapping and sentenced to death.

In 1996, Krone won a new trial on appeal, but was convicted again based mainly on the state's supposed expert bite mark testimony. This time, however, the judge sentenced him to life in prison, citing doubts about whether or not Krone was the true killer. It was not until 2002, after Krone had served more than 10 years in

⁵ All representations that the dentists at issue in this appendix were "board-certified ABFO Diplomates" are based on the *American Board of Forensic Odontology Diplomate Information, Updated 8/2017*, available at <http://abfo.org/wp-content/uploads/2017/05/ABFO-Diplomate-Information-revised-August-2017.pdf>.

⁶ Fernando Santos, *In Quest for a Killer, an Inmate Finds Vindication*, N.Y. TIMES, Dec. 21, 2006, available at http://www.nytimes.com/2006/12/21/nyregion/21brown.html?pagewanted=all&_r=1. See also The Innocence Project, *Roy Brown*, available at <http://www.innocenceproject.org/cases/roy-brown/>; Brandon L. Garrett, *Convicting the Innocent: Where Criminal Prosecutions Go Wrong* 108-09 (Harvard University Press 2011); Dr. Mofson's 1992 trial court testimony, available at <http://www.law.virginia.edu/pdf/faculty/garrett/innocence/brown1.pdf>; David Lohr, *Quest for Freedom: The True Story of Roy Brown*, available at http://www.trutv.com/library/crime/criminal_mind/forensics/ff311_roy_brown/5.html.

prison, that DNA testing proved his innocence.⁷

7. Calvin Washington &

- 8. Joe Sidney Williams:** Calvin Washington was convicted of capital murder in 1987 after a woman was found beaten, raped, and murdered in Waco, Texas. It was alleged that Washington and Williams murdered and sexually assaulted the victim in the course of committing a burglary. A forensic dentist and former president of the American Academy of Forensic Sciences, Dr. Homer Campbell, testified that a bite mark found on the victim was "consistent with" Williams' dentition. While Campbell excluded Washington as the source of the bite mark, his bite mark testimony about Williams (which was given at Washington's trial) tied Washington to the crime.

After serving more than 13 years of his sentence, Washington was finally exonerated in 2000 when DNA testing showed that blood on a shirt found in Washington's home did not come from the victim, as previously asserted; testing conducted a year later pointed to another man as the perpetrator.⁸ Prior to Washington's exoneration, the Texas Court of Criminal Appeals had set aside Williams' conviction in 1992, and the charges against Williams were dismissed on June 30, 1993.

- 9. James O'Donnell:** James O'Donnell was convicted in 1998 of attempted sodomy and second-degree assault. Board-certified ABFO Diplomate Dr. Harvey Silverstein opined that a bite mark on the victim's hand was consistent with O'Donnell's dentition. Based on an eyewitness' identification and the bite mark evidence, and despite testimony from O'Donnell's wife and son that he had been at home with them when the crime occurred, the jury convicted O'Donnell. He was sentenced to three-and-a-half to seven years in prison.

In 2000, after DNA samples from a rape kit excluded O'Donnell as the source of the semen found on the victim, his conviction was formally vacated.⁹

- 10. Levon Brooks:** Levon Brooks spent 16 years in prison for the rape and murder of a three-year-old girl that he did not commit. Forensic dentist Dr. Michael West claimed that the marks on the victim's body were human bite marks and he testified at Brooks' trial that, of 13 suspects whose dentitions he had compared to the wounds on the victim's body, Brooks' teeth "matched" the marks on the

⁷ The Innocence Project, *Ray Krone*, available at <http://www.innocenceproject.org/cases/ray-krone/>.

⁸ The Innocence Project, *Calvin Washington*, available at <http://www.innocenceproject.org/cases/calvin-washington/>. See also Michael Hall, *The Exonerated*, TEXAS MONTHLY, Nov. 2008, available at <http://www.texasmonthly.com/articles/the-exonerated/>.

⁹ The Innocence Project, *News: Cases Where DNA Revealed That Bite Mark Analysis Led to Wrongful Arrests and Convictions*, available at <http://www.innocenceproject.org/cases-where-dna-revealed-that-bite-mark-analysis-led-to-wrongful-arrests-and-convictions/>. See also Dr. Silverstein's 1998 trial court testimony, available at <http://www.law.virginia.edu/pdf/faculty/garrett/innocence/odonnell.pdf>.

victim. As he explained, "it could be no one but Levon Brooks that bit this girl's arm." Based on this testimony, Brooks was convicted of capital murder and sentenced to life in prison.

In 2001, DNA testing and a subsequent confession revealed that Justin Albert Johnson committed the murder. Johnson had been one of the 12 other suspects whose dental impressions Dr. West had determined did not match the bite marks on the victim's body. Following Johnson's confession, Brooks was freed on February 15, 2008.¹⁰

11. Kennedy Brewer: In 1992, Kennedy Brewer was arrested in Mississippi and accused of killing his girlfriend's three-year-old daughter. The medical examiner who conducted the autopsy, Dr. Steven Hayne, testified that he had found several marks on the victim's body that he believed to be bite marks. Hayne called in Dr. Michael West to analyze the marks, and Dr. West concluded that 19 marks found on the victim's body were "indeed and without a doubt" inflicted by Brewer. Brewer was convicted of capital murder and sexual battery on March 24, 1995, and sentenced to death. His conviction was based almost entirely on the bite mark evidence.

In 2001, DNA tests proved that Justin Albert Johnson, not Kennedy Brewer, committed the crime; Johnson was the same individual responsible for murdering the child in the Levon Brooks case. As a result of the DNA testing, Brewer's conviction was overturned. He had served seven years on death row and one year in jail awaiting trial.¹¹

12. Bennie Starks: Bennie Starks was convicted of raping and assaulting a 69-year-old woman in 1986, based, in part, on testimony by two forensic dentists, Drs. Russell Schneider and Carl Hagstrom. Both dentists testified that a bite mark on the victim's shoulder matched Starks' dentition. Starks spent 20 years in prison before an appeals court ordered a new trial, after DNA testing of semen recovered from the victim excluded Starks. On January 7, 2013, the state's attorney dismissed all charges against Starks.¹²

¹⁰ The Innocence Project, *Levon Brooks*, available at <http://www.innocenceproject.org/cases/levon-brooks/>.

¹¹ The Innocence Project, *Kennedy Brewer*, available at <http://www.innocenceproject.org/cases/kennedy-brewer/>.

¹² The Innocence Project, *Bennie Starks Exonerated After 25 Year Struggle to Clear His Name*, <http://www.innocenceproject.org/bennie-starks-exonerated-after-25-year-struggle-to-clear-his-name/>. See also Lisa Black, *Exonerated Man's Ordeal Ends: 'I Am Overwhelmed with Joy'*, CHICAGO TRIBUNE, Jan. 7, 2013, available at http://articles.chicagotribune.com/2013-01-07/news/chi-bennie-starks-lake-county-charges-dropped_1_bennie-starks-mike-nerheim-ordeal-ends; Donna Domino, *Dentists Sue Over Bite Mark Testimony*, available at <http://www.drbcusp.com/index.aspx?sec=nws&sub=rad&pag=dis&ItemID=309572>.

13. Michael Cristini &

14. Jeffrey Moldowan: In 1991, Michael Cristini and Jeffrey Moldowan were convicted of the rape, kidnapping, and attempted murder of Moldowan's ex-girlfriend, Maureen Fournier. At trial, two board-certified ABFO Diplomates, Drs. Allan Warnick and Pamela Hammel, testified that bite marks on the victim's body had to have come from both defendants, to the exclusion of all others. Both men were convicted. Cristini was sentenced to 44 to 60 years, and Moldowan to 60 to 90 years.

After the conviction, an investigator hired by the Moldowan family found a witness who said he had seen four black men standing around a naked woman at the scene of the crime. The witness' story contradicted Fournier's, as Cristini and Moldowan are both white. Dr. Hammel then recanted her testimony, saying that she had been uncertain that either defendant had in fact been responsible for the bite marks. According to Dr. Hammel, she had agreed to testify only when Dr. Warnick had assured her that a third odontologist had also confirmed that the bite marks could be matched to Cristini and Moldowan to the exclusion of all others.

On October 20, 2003, the Macomb County Circuit Court granted Cristini a new trial, citing the new eyewitness evidence, Dr. Hammel's recantation, and stronger alibi evidence. Cristini was acquitted by a jury on April 8, 2004, after having served 13 years in prison. Later, Cristini filed wrongful conviction lawsuits against the City of Warren, Macomb County, and Dr. Warnick. The suit against Dr. Warnick was settled quickly for an undisclosed amount.

In 2002, the Michigan Supreme Court reversed Moldowan's conviction. On retrial, in February 2003, Moldowan was acquitted of all charges and released, having served nearly twelve years in prison. Moldowan's lawsuit was settled for \$2.8 million in 2011.¹³

15. Anthony Keko: Anthony Keko was convicted in 1994 for the 1991 murder of his estranged wife, Louise Keko. Dr. Michael West testified that a bite mark on the victim's shoulder matched Anthony Keko's dentition. Dr. West's testimony was the only direct evidence linking Keko to the crime, and prosecutors conceded that without the bite mark evidence there was no case. Keko was found guilty and

¹³ *People v. Moldowan*, 466 Mich. 862, 643 N.W.2d 570 (2002); *Moldowan v. City of Warren*, 578 F.3d 351 (6th Cir. 2009); Ed White, *Warren Settles Rape Case Lawsuit for \$2.8 Million – Falsely Imprisoned Man Sued for Violation of His Civil Rights*, DETROIT LEGAL NEWS, Oct. 19, 2011, available at <http://www.legalnews.com/detroit/1109085>; Jameson Cook, *Michael Cristini Wants Bigger Settlement than Jeffrey Moldowan*, MACOMB DAILY, Dec. 25, 2012, available at http://www.macombdaily.com/article/20121225/NEWS01/121229769/michael-cristini-wants-bigger-settlement-than-jeffrey-moldowan#full_story; Michael S. Perry, *Exoneration Case Detail: Michael Cristini*, NAT'L REGISTRY OF EXONERATIONS, available at <http://www.law.umich.edu/special/exoneration/Pages/casedetail.aspx?caseid=3133>; Hans Sherrer, *Prosecutor Indicted For Bribery After Two Men Exonerated of Kidnapping and Rape*, JUSTICE: DENIED, 2005, at 10, available at http://www.justicedenied.org/issue/issue_27/Moldowan_cristini_exonerated.html.

sentenced to life in prison. In December 1994, however, the trial judge became aware of previously undisclosed disciplinary proceedings against Dr. West. The judge began to express doubts regarding West's forensic abilities and ultimately reversed Keko's conviction.¹⁴

16. Harold Hill &

17. Dan Young, Jr.: Harold Hill was 16 when he and his codefendant, Dan Young, Jr., were convicted of the rape and murder of 39-year-old Kathy Morgan in 1990. Both men would end up spending 15 years in prison for a crime they did not commit. At trial, board-certified ABFO Diplomate Dr. John Kenney linked a bruise and a bite mark on the victim's body to Hill and Young. Both were found guilty and sentenced to life in prison without parole. It wasn't until 2004 that DNA tests excluded both Hill and Young as the source of DNA evidence found on the victim. In 2005, prosecutors finally dismissed the charges against both men. Dr. Kenney later said that the prosecution pushed him to exaggerate his results.¹⁵

18. Greg Wilhoit: Greg Wilhoit's wife, Kathy, was murdered in Tulsa, Oklahoma, in June 1985. Wilhoit was left to raise his two daughters—a 4-month-old and a 1-year-old. A year later, he was arrested and charged with the murder based on the opinions of two forensic odontologists, Drs. Richard Glass and Keith Montgomery, that his dentition matched a bite mark on his wife's body. Wilhoit was found guilty and sentenced to death.

During his appeal, other forensic odontologists examined the bite mark evidence and independently concluded that the bite mark could not be matched to Wilhoit. He was released on bail for two years, and when a retrial was finally held in 1993, the judge issued a directed innocence verdict. In total, Wilhoit dealt with this tragedy for 8 years, fighting a case built entirely on bite mark analysis. Wilhoit's story was documented by John Grisham in "The Innocent Man."¹⁶

19. Crystal Weimer: A Fayette County, Pennsylvania, jury convicted Crystal Weimer of third-degree murder in 2006 for the beating death of Curtis Haith. Apart from a jailhouse informant, the only evidence placing Weimer at the scene was the testimony of forensic odontologist Dr. Constantine Karazulas, who

¹⁴ *A Dentist Takes The Stand*, NEWSWEEK, Aug. 19, 2001, available at <http://www.newsweek.com/dentist-takes-stand-151357>; Mark Hansen, *Out of the Blue*, ABA J., Feb. 1996, available at http://www.abajournal.com/magazine/article/out_of_the_blue/print/.

¹⁵ Ctr. on Wrongful Convictions, *Exoneration Case Detail: Harold Hill*, NAT'L REGISTRY OF EXONERATIONS, available at <http://www.law.umich.edu/special/exoneration/Pages/casedetail.aspx?caseid=3296>.

¹⁶ Journey of Hope, *Greg Wilhoit*, available at <https://www.journeyofhope.org/who-we-are/exonerated-from-death-row/greg-wilhoit/>; Witness to Innocence, *Exonerees: Greg Wilhoit, 1954-2014*, available at <http://www.witnesstoinnocence.org/exonerees/greg-wilhoit.html>; *Wilhoit v. State*, 816 P.2d 545, 547 (Okla. Crim. App. 1991).

concluded that a bite mark on the victim's hand was a "match" with Weimar's dentition. After the National Academy of Science's landmark 2009 report, *Strengthening Forensic Science in the United States: A Path Forward*, criticized the lack of scientific support for bite mark analysis, Dr. Karazulas undertook an independent review of the "science" of bite mark evidence and his testimony. He concluded that bite marks cannot be used for conclusive matches to an individual. On the basis of Dr. Karazulas' recantation, as well as a recantation from the informant, Weimar's conviction was vacated in October 2015, and the underlying indictment was dismissed in June 2016.¹⁷

20. Steven Mark Chaney: Steven Chaney was convicted of the murder of John Sweek, a Dallas-area cocaine dealer, in 1987; Sweek's wife was also killed. Although nine alibi witnesses accounted for Chaney's whereabouts on the day the crime occurred, the state's case relied largely on the testimony of two ABFO board-certified forensic dentists, Drs. Jim Hales and Homer Campbell. At trial, Dr. Hales purported to match a bite mark on the victim's arm to Chaney and claimed that there was a "one to a million" chance that someone other than Chaney was the biter. Similarly, Dr. Campbell opined to a reasonable degree of dental certainty that Chaney left the bite mark. Decades after Chaney's conviction, Dr. Hales admitted that his matching testimony exceeded the limits of the science and that, in contrast to his claims at trial, there was no basis for his statistical testimony in the "scientific literature." In light of the change in the scientific understanding of bite mark evidence since 1987 and Dr. Hales' recantation, the Dallas County District Attorney's Office agreed to vacate Mr. Chaney's conviction pursuant to Texas' "junk science writ," which provides an avenue for post-conviction relief where the science used at trial is subsequently discredited. In October 2015, Chaney was released after 28 years of wrongful incarceration.¹⁸ Although Mr. Chaney was released from custody in October 2015, he wasn't declared "actually innocent" until December 19, 2019 by the Texas Court of Criminal Appeals. In declaring Mr. Chaney "actually innocent", the Texas Court of Criminal Appeals cites extensively from the 2009 NAS report, invalidating the use of bite mark analysis in his conviction. More specifically, the Texas high court reasoned that "the body of scientific knowledge underlying the field of bitemark comparisons evolved in a way that discredits almost all the probabilistic bitemark evidence at trial."¹⁹ In reaching the conclusion that

¹⁷ Joe Mandak, *Bite-mark backtrack helps toss verdict*, BOSTON GLOBE, Oct. 2, 2015, available at <https://www.bostonglobe.com/news/nation/2015/10/01/woman-conviction-tossed-junk-science-bite-mark-case/Dgi1n45ib85uqdW1u2yqNO/story.html>; *Judge dismisses charges in bite-mark conviction*, ASSOCIATED PRESS, June 29, 2016, available at <https://www.indianagazette.com/news/police-courts/judge-dismisses-charges-in-bitemark-conviction.24491656/>.

¹⁸ Jennifer Emily, *Dallas County man freed after serving 25 years for murder over faulty science of bite marks*, DALLAS MORNING NEWS, Oct. 12, 2015, available at <http://crimeblog.dallasnews.com/2015/10/dallas-county-man-freed-after-serving-25-years-for-murder-over-faulty-science-of-bite-marks.html/>.

¹⁹ *Ex parte Chaney*, No. WR-84,091-01, 2018 WL 6710279 (Tex. Dec. 19, 2018)

bitemark evidence has been discredited, the *Chaney* court cited to the NAS Report and to new scientific research undermining the fundamental assumptions of bite mark analysis, especially research on cadavers by a SUNY Buffalo team lead by Dr. Mary Bush. After marshaling this new evidence, the State of Texas concluded that the “‘bitemark evidence, which once appeared proof positive of... Chaney’s guilt, no longer proves anything.’”²⁰

21. William Joseph Richards: In 1997, Bill Richards was convicted of the 1993 murder of his estranged wife. On the night of her murder, Richards returned home from the graveyard shift at his job and discovered his wife bludgeoned to death. The crime scene evidence revealed a violent struggle, and an autopsy of the victim uncovered a crescent-shaped lesion on her hand. To analyze that wound, the prosecution contacted Dr. Norman Sperber, an ABFO Diplomate, who examined a photograph of the lesion and opined that the wound was a human bite mark. At Richards' fourth trial—the first three attempts to try Richards did not include bite mark evidence and ended in mistrials—Dr. Sperber testified that his comparison of Richards' dentition to the photograph of the purported bite mark yielded a "pretty good alignment," and that Richards' teeth were consistent with the lesion. Dr. Sperber also testified that one facet of Richards' dentition was relatively rare. Richards presented an alibi defense based on the time of death, and he presented testimony from another ABFO board-certified forensic odontologist, Dr. Gregory Golden, who opined that although he could not eliminate Richards as the source of the bite, five out of fifteen sample dental molds from his clients in private practice also matched the lesion. With the introduction of the bite mark testimony, Richards was convicted and given a 25 year to life sentence.

In 2007, Dr. Sperber recanted his bite mark testimony at a post-conviction evidentiary hearing, but the California Supreme Court ultimately ruled against Richards in 2012, finding that recanted expert testimony does not constitute "false evidence." In response to the Court's decision, the California state legislature amended the habeas corpus statute the following year to explicitly deem expert recantations false evidence, and Richards filed a successive habeas petition shortly thereafter. In May 2016, the California Supreme Court finally granted his habeas petition and vacated his conviction.²¹ In June 2016, the district attorney dismissed all charges against Richards.²²

22. Alfred Swinton: On January 13, 1991, the body of 28-year-old Carla Terry was found in a snow bank in Hartford, Connecticut. Detectives quickly focused their attention on Alfred Swinton, whom witnesses claimed to see at the bar Terry visited on the night of her death. Swinton, who was 42 years old at the time and had no significant criminal record, maintained his innocence from the outset of

²⁰ Ex parte Chaney, No. WR-84,091-01, 2018 WL 6710279 (Tex. Dec. 19, 2018)

²¹ *In re Richards*, 63 Cal. 4th 291, 371 P.3d 195 (2016).

²² Jordan Smith, *After 23 years and four trials, prosecutors finally dismiss charges against Bill Richards*, INTERCEPT, June 28, 2016, available at <https://theintercept.com/2016/06/28/after-23-years-and-four-trials-prosecutors-finally-dismiss-charges-against-bill-richards/>.

the investigation. Nevertheless, he was arrested several months later, after detectives recovered a bra believed to be Terry's from a common area of Swinton's apartment building. At a probable cause hearing, the state presented testimony from forensic odontologist and ABFO Diplomate Dr. Lester Luntz, who linked a bite mark on the victim's breast to Swinton's teeth. However, the court concluded that the evidence underlying Swinton's arrest was insufficient to establish probable cause, and he was released.

The case went cold for the next several years, until officials reinvestigated the murder through a statewide effort to close previously unsolved homicides. That reinvestigation again culminated in Swinton's arrest. At a subsequent probable cause hearing, the victim's sister—who had not identified the bra in 1991—changed her testimony and asserted that she had given the bra found in Swinton's building to Terry on the night of the murder. In addition, forensic dentist Dr. Constantine "Gus" Karazulas testified for the prosecution that, to a reasonable degree of scientific certainty, Swinton was the source of the bite mark. On the basis of this new evidence, the court found that probable cause existed for Swinton's arrest. Though there were only two pieces of physical evidence purportedly linking Swinton to the crime—the bra identified by Terry's sister and the alleged bite mark match—the trial spanned nearly two months, of which five days were devoted to Dr. Karazulas' testimony. Ultimately, a jury found Swinton guilty of murder, and he was sentenced to 60 years imprisonment.

In 2014 and 2015, key pieces of evidence from the murder were subjected to modern DNA testing and excluded Mr. Swinton. In particular, the testing developed a male DNA profile from swabs of the bite mark that did not match Swinton. Additionally, "touch" DNA testing was conducted on the bra; both Swinton and Terry were excluded as the source of skin cells on the bra, suggesting that the bra did not belong to Terry. In 2017, fingernail scrapings from the victim underwent testing, and the results also excluded Swinton. Independently, Dr. Karazulas, who disavowed bite mark evidence as unvalidated and unreliable in the wake of the National Academy of Sciences' landmark 2009 report on forensic science, recanted his testimony in its entirety. On the basis of the new DNA evidence and the new evidence discrediting the bite mark comparison, Swinton filed a petition for a new trial. With the consent of the Hartford State's Attorney, the court granted Swinton's request on June 8, 2017. Following the vacatur, additional DNA testing of the victim's jeans and bra and of human hairs found at the crime scene excluded Mr. Swinton. The charges against him were dismissed on March 1, 2018, after more than 19 years of wrongful incarceration and nearly 26 years after his initial arrest.²³

²³ The Innocence Project, *With Consent of State's Attorney, Connecticut Court Vacates 2001 Murder Conviction Based on DNA and Other Evidence; Alfred Swinton Released*, available at <https://www.innocenceproject.org/alfred-swinton-exonerated-and-released-after-19-years-in-prison/>; David Owens & Dave Altimari, *Murder Charge Dismissed Against Alfred Swinton, Man Who Served 18 Years After Wrongful Conviction*, Hartford Courant, March 1, 2018, available at <http://www.courant.com/news/connecticut/hc-alfred-swinton-freed-20180301-story.html>.

23. Sherwood Brown: Sherwood Brown spent 24 years on death row in Mississippi before his capital murder convictions were overturned. Though Brown has consistently maintained his innocence, he was implicated in the January 1993 murder of a thirteen-year-old neighbor, her mother, and her grandmother in their DeSoto County home. From the crime scene, investigators followed a trail of bloody shoeprints toward a dirt road near Brown’s home. Four days later, when Brown was arrested, they seized a pair of Brown’s sneakers that tested positive for blood. The arresting officers also noticed a wound on Brown’s wrist. Two forensic dentists, Drs. Harry Mincer and Michael West, were called to examine the wound, which they deemed a human bite mark. At Brown’s 1995 trial, Drs. West and Mincer testified that the pattern injury on Brown matched the child-victim’s teeth. Dr. Mincer testified that “the teeth of [the child victim] highly probably had made the bite mark on . . . the left wrist of Sherwood Brown.” He also told Brown’s jury that he had a zero error rate for bite mark comparisons and “thought [he] was always right.” In addition to the odontologists, the prosecution called an FBI agent, Geary Kanaskie, who testified that the sneakers seized from Brown were consistent with the crime scene shoeprints, and an acquaintance of Brown, who alleged that Brown confessed to him that he committed the murders. In 2012, Brown won the right to subject evidence from the crime scene to DNA testing. The results of the testing uncovered a foreign male’s genetic profile in the child-victim’s saliva, on the cup of her bra, and in hairs from scrapings of her pubic region, but Brown was excluded as the source of all the DNA, proving that she neither bit Brown nor that he attacked her. Moreover, post-conviction DNA testing revealed that the blood on Brown’s sneakers did not match the profiles of any of the murder victims, severing any link between Brown and the crime scene. In October 2017, on the basis of the new DNA evidence and new research discrediting the bite mark evidence generally, the Mississippi Supreme Court vacated Brown’s conviction and ordered a new trial. The case has been remanded to the Circuit Court of DeSoto County, where the State is weighing whether to pursue a re-trial.²⁴

24. John Kunco: On December 16, 1990, a woman awoke in the early morning hours to find a man in her Westmoreland County, Pennsylvania, apartment. Over the ensuing six hours, the man raped, tortured, and bit the woman before fleeing. When she reported to the hospital, medical personnel photographed the purported bite mark on her shoulder. The victim, who was blind in one eye and farsighted in the other, could not identify her assailant, but she came to believe that Mr. Kunco—who had worked as a maintenance man in her building and whom she had met briefly once before—was the assailant after a police officer visited her in

²⁴ *Brown v. State*, 690 So.2d 276 (Miss. 1996). See also *Brown v. State*, No. 2017-DR-00206-SCT (Miss. Oct. 26, 2017) (en banc), https://courts.ms.gov/newsite2/appellatecourts/docket/sendPDF.php?f=700_342377.pdf&c=85895&a=N&s=2.

the hospital two days after the assault and, despite never speaking with Mr. Kunco, imitated the lips with which he purportedly spoke.

While at the hospital, law enforcement agents photographed the suspected bite mark on the victim's shoulder. During the prosecutor's review of the case file, he noticed the bite mark photo and called a Pennsylvania-based Diplomat, Dr. Michael N. Sobel, who in turn consulted with Dr. Thomas David, his colleague in the ABFO. Drs. David and Sobel could not analyze the bite mark photograph because the contemporaneous picture lacked a reference scale. Instead, five months after the attack and after the wound had completely healed, the odontologists utilized a now-discredited method, pioneered by Dr. Michael H. West, to "recapture" and "illuminate" the "crucial" bite mark evidence through ultraviolet photography.²⁵ At trial, both dentists testified to a reasonable degree of dental certainty that Mr. Kunco's teeth inflicted the wound on the victim's shoulder. In his defense, Mr. Kunco presented an alibi, which was corroborated during post-conviction investigations by a witness who was on the phone with Mr. Kunco at the time of the attack and who documented their call. A jury found Mr. Kunco guilty, based on the bite mark evidence, the unreliable voice imitation, and a statement from an acquaintance who claimed to hear Mr. Kunco allude to an aspect of the attack at a holiday party. He was sentenced to 45 to 90 years imprisonment.

In 2009, Mr. Kunco's team at the Innocence Project secured DNA testing of a lamp cord used to torture the victim. Although the testing identified a male DNA profile that excluded Mr. Kunco, the court refused to vacate the conviction, ruling that the bite mark evidence was so strong that the jury would not change its verdict. He filed a subsequent petition for DNA testing in 2016, after the ABFO changed its guidelines and national reviews of bite mark evidence determined the technique to be unreliable. In addition, Drs. David and Sobel recanted their trial testimony, because the "scientific knowledge and understanding on which [their] conclusions were based . . . has changed significantly since they were given in 1991." Finding the bite mark evidence "problematic, if not entirely incredible," Pennsylvania courts allowed Mr. Kunco to conduct additional DNA testing, which excluded him from a single-source unknown male's DNA profile from blood on the blanket on which the victim was raped. In light of the discredited bite mark evidence and the outcome of the DNA testing, on May 23, 2018, the Westmoreland County Court of Common Pleas vacated Mr. Kunco's 1990 conviction, though prosecutors have indicated that they intend to retry Mr. Kunco.²⁶

25. **Gary Cifizzari:** On September 29, 1979, 75-year-old Concetta Schiappa's badly beaten body was found in her home in Milford, Massachusetts. She'd been savagely raped and bludgeoned to death. During the autopsy, a forensic dentist

²⁵ Thomas J. David & Michael N. Sobel, *Recapturing a Five-Month-Old Bite Mark By Means of Reflective Ultraviolet Photography*, 39 J. FORENSIC SCI. 1560 (1994).

²⁶ *Commonwealth v. Kunco*, 2017 PA Super 345.

and past president of the American Board of Forensic Odontology (ABFO), Dr. Stanley Schwartz, took photographs of the bruises on Schiappa's body, and used rubber molds to make an impressions of the marks. Police initially suspected her neighbor, Michael Giroux, because Schiappa had accused him of entering her home and stealing money earlier that year. Although Mr. Giroux's statements to police about his whereabouts the night of the murder were inconsistent, police dropped him as a suspect, and the case ran cold. Years later, Gary Cifizzari's brother Michael, who suffered from schizophrenia, came to the police station seeking food and shelter. Apparently because Michael was related to the victim (he and Gary were Schiappa's great-nephews), police questioned Michael about the murder. After hours of coercive interrogation, Michael falsely confessed, claiming that he and his cousin, Robert Cananze, had been "drugged out" and gone to Schiappa's house to ask for money and attacked her. Detectives asked Michael whether he was sure that he had been with Cananze, and not his brother, Gary. Michael then implicated his Gary.

Michael Cifizzari was convicted of murder and sentenced to life in prison, where he died 2000. Gary Cifizzari's was tried separately in Worcester County Superior Court. The State's case against him was based almost solely the testimony of three forensic dentists: Schwartz, Richard Souviron, and Anthony Captline. All three expert witnesses "matched" Gary Cifizzari's teeth to two alleged bite marks on Schiappa's body; Souviron testified that "the teeth of Gary Cifizzari were the teeth that inflicted both bitemarks, one on the leg and one on the stomach."²⁷

Cifizzari was convicted of first-degree murder and sentenced to life in prison without the possibility of parole. Always maintaining his innocence, Cifizzari immediately appealed his conviction, challenging the admission of the bite mark testimony. But in a case of first impression for Massachusetts, the state's high court rejected Cifizzari's argument that bite mark should not have been admitted because it had not gained acceptance in the scientific community. Instead, the court found that "a foundation need not be laid that such evidence has gained acceptance in the scientific community. What must be established is the reliability of the procedures involved, such as X-rays, models, and photographs."²⁸ Thus, Cifizzari's appeal not only condemned him to life in prison for a crime he did not commit, but opened the door for other defendants to be tried in Massachusetts based on the same grossly unreliable technique. (Cases of first impression in two other states also approved the admission of bite mark evidence in wrongful conviction cases, [Levon Brooks](#) in Mississippi and [Robert Lee Stinson](#) in Wisconsin.)

In 2017, Mr. Cifizzari became a client of the New England Innocence Project. In 2018, NEIP moved for DNA testing of dozens of pieces of physical evidence retained from the case. Ultimately, DNA testing conducted on various items

²⁷ Ken Otterbourg, *Gary Cifizzari*, Jan. 8, 2020, <https://www.law.umich.edu/special/exoneration/Pages/casedetail.aspx?caseid=5650>

²⁸ *Commonwealth v. Cifizzari*, 397 Mass. 560, 573, 492 N.E.2d 357 (1986).

recovered from the crime scene excluded Cifizzari and his brother Michael. A DNA profile developed from the victim's nightgown was uploaded was matched to Michael Giroux, the police's initial suspect. Giroux went on to commit additional violent crimes, including another homicide in Rhode Island. On July 16, 2019 Mr. Cifizzari was freed after 35 years of wrongful imprisonment and on December 10, 2019 prosecutors dismissed the indictment.

- 26. Sheila Denton:** On May 21, 2004, Eugene Garner's body was found at his residence in Waycross, Georgia. He had been beaten and strangled to death. Police initially questioned Sharon Jones about the murder. Ms. Jones, a crack cocaine user who could not distinguish between days of the week, was initially interrogated as a potential suspect and was told by the police that there was videotape of her at the scene, along with her fingerprints.²⁹ Pressured by the police to name another suspect or she herself would be charged with the murder, Ms. Jones claimed that Sheila Denton had implicated herself in the crime.³⁰ The police then located and interrogated Ms. Denton, an acquaintance of the deceased. Although she maintained her innocence, the police rejected her statement and charged her with Mr. Garner's murder in June of 2004.

At autopsy, an injury on Ms. Garner's body was identified as a potential bite mark. A mark on Ms. Denton's arm, photographed upon her arrest, was considered a potential bite mark as well. Dr. Thomas David, DDS, a Diplomate of the American Board of Forensic Odontology (ABFO), the board-certifying body for forensic dentists, examined the alleged bite marks and outlines of Ms. Denton and Mr. Garner's teeth. At trial, Dr. David testified: "Based on an evaluation of all evidence available, it is my opinion that the bite mark on the left arm of Sheila Denton was probably made by Eugene Garner. It is also my opinion that the bite mark on the right arm of Eugene Garner was probably made by Sheila Denton. I hold these opinions to a reasonable degree of scientific certainty."³¹

Aside from the supposed bite mark evidence, the only other evidence introduced at trial was Ms. Jones' statement, who admitted that she was high on crack at the time she claimed Ms. Denton had implicated herself and that she did not actually believe Ms. Denton when she made the alleged inculpatory statement. Indeed, in his closing statement, the prosecutor told the jury that without the "bite mark" evidence, there was reasonable doubt. Ms. Denton was nevertheless convicted of felony murder and sentenced to life in prison.

In 2017, the Southern Center for Human Rights (SCHR) filed a motion for a new trial based on the discrediting of bite mark analysis as forensic technique. With the assistance of the Innocence Project, Ms. Denton obtained affidavits from five forensic dentists, all of whom stated that bite mark evidence is fundamentally unreliable and should not have been used to convict Ms. Denton. Moreover, the experts opined, based on today's scientific standards and understanding of the

²⁹ Jessica Noll, Andy Pierotti, *Flawed Forensics: Woman's fate hangs on 'garbage' evidence*, 11Alive News, Nov. 16, 2018, <https://www.11alive.com/article/news/investigations/flawed-forensics-womans-fate-hangs-on-garbage-evidence/85-7fa789d6-32ba-4515-80e3-36ce796571d6>

³⁰ *State v. Denton*, 04R-330 at 338 (Ware Cnty. Super. Ct. Mar. 13, 2006)

³¹ *Id.* at 158-159

limitations of bite mark evidence, that none of the injuries claimed were even bite marks in the first place, despite Dr. David's testimony to the contrary.

On May 29, 2018, an evidentiary hearing was held on the validity of the bite mark evidence generally, and the specific evidence presented at Ms. Denton's trial. Following the evidentiary hearing, the Court concluded that the "bite mark evidence presented in [Ms.] Denton's trial was not competent evidence."³² And on February 7, 2020, the Chief Judge of the Superior Court for the Waycross Judicial Circuit in Georgia reversed Ms. Denton's 2004 murder conviction. Finding that "the bite mark evidence used at trial is now known to be unsupported by science,"³³ the Court went on to state that bite mark evidence "will seldom, if ever, be probative of one having inflicted a particular bite mark, nor shall it likely be of any aid to a jury in reaching a decision. The future of admissibility of such evidence is dubious at best."³⁴ On April 8, 2020, with the consent of the State, Ms. Denton was released from prison after serving over 15 years.

³² State v. Denton, 2020 Ga. Super. LEXIS 5*35 (Feb. 7, 2020)

³³ *Id.* at 24

³⁴ *Id.* at 17

DESCRIPTIONS OF WRONGFUL INDICTMENTS BASED ON BITE MARK EVIDENCE

1. **Dale Morris, Jr.:** In 1997, Dale Morris, Jr., was arrested based on bite mark analysis matching his dentition to a mark found on a nine-year-old murder victim, Sharra Ferger. Morris was a neighbor to the little girl, who had been found stabbed, sexually assaulted, and bitten in a field near her Florida home. Board-certified ABFO Diplomates Dr. Richard Souviron and Dr. Kenneth Martin agreed that the bite marks on the girl were a probable match to Morris. Morris spent four months in jail until DNA tests proved his innocence. Highlighting the importance of the bite mark evidence to the police's decision to arrest Morris, Detective John Corbin said that Morris "was probably one of our least likely suspects in the neighborhood, but through the forensics that we conducted in the investigation he was linked to the crime."³⁵

2. **James Earl Gates:** In April 1997, prosecutors from Humphreys County, Mississippi, arrested James Earl Gates for the capital murder of his then-girlfriend. Gates' indictment rested solely on the purported match between a bite mark found on the victim and Gates' teeth. Dr. Steven Hayne claimed to have found bite marks on the victim while conducting an autopsy, and forensic odontologist Dr. Michael West confirmed the marks were bites and concluded that they matched Gates' dentition. Gates spent several months in jail awaiting trial before nascent DNA technology excluded him from a profile obtained from scrapings from the victim's fingernails. Prosecutors subsequently dismissed the case. In 2012, the Mississippi Crime Lab, at the request of Humphreys County law enforcement, engaged in additional DNA testing of the biological material collected at the murder scene. Because of advancements in technology, the subsequent testing yielded an identifiable profile of an individual who had, in the initial stages of investigation, been a prime suspect. That individual had since been convicted of another homicide.³⁶

3. **Edmund Burke:** In 1998, Edmund Burke was arrested for raping and murdering a 75-year-old woman. The victim had bite marks on her breasts, and board-certified ABFO Diplomat Dr. Lowell Levine "formed an initial opinion that Burke could not be excluded as the source of the bite marks" but asked to see enhanced photos before rendering a final opinion. After examining the enhanced

³⁵ Ian James & Geoff Dougherty, *Suspect in Girl's Murder Freed after Four Months*, ST. PETERSBURG TIMES, Feb. 28, 1998, at 1.A, available at http://www.wearethehope.org/pdf/times_02_28_1998.pdf; The Innocence Project, *Cases Where DNA Revealed That Bite Mark Analysis Led to Wrongful Arrests and Convictions*, *supra* n.9; Flynn McRoberts & Steve Mills, *From the Start, a Faulty Science*, CHICAGO TRIBUNE, Oct. 19, 2004, available at <http://www.chicagotribune.com/news/watchdog/chi-041019forensics.0.7597688.story>.

³⁶ Radley Balko, *Solving Kathy Mabry's Murder: Brutal 15-Year-Old Crime Highlights Decades-Long Mississippi Scandal*, HUFFINGTON POST, Nov. 7, 2013, available at http://www.huffingtonpost.com/2013/01/17/kathy-mabry-murder-steven-hayne-michael-west_n_2456970.html.

photos, Dr. Levine concluded that Burke's teeth matched the bite mark on the victim's left breast to a "reasonable degree of scientific certainty." DNA testing of saliva taken from the bite mark site excluded Burke as the source of the DNA, however, and prosecutors dropped the case against him. The person who actually committed the crime was later identified when DNA from the bite mark was matched to a profile in the national DNA database. Dr. Levine remains one of the few full-time forensic odontologists in the nation, and is regarded as one of the field's top practitioners.³⁷

4. **Anthony Otero:** In 1994, Anthony Otero was charged with larceny and the first-degree murder and rape of a 60-year-old woman, Virginia Airasolo, in Detroit, Michigan. A warrant for Otero's arrest was issued after ABFO Diplomate Dr. Allan Warnick claimed to have matched the bite marks on the victim's body to Otero's dentition. At the preliminary hearing on December 13, 1994, Dr. Warnick testified that Otero was "the only person in the world" who could have caused the bite marks on Airasolo's body.

In January 1995, DNA testing excluded Otero as the source of the DNA found on the victim and he was released in April, after spending five months in jail. Following Otero's release, a second forensic odontologist, ABFO Diplomate Dr. Richard Souviron, concluded that the marks on the victim were consistent with human bite marks but were too indistinct to be used to identify a suspect. Ultimately, the charges against Otero were dismissed.³⁸

5. **Johnny Bourn:** In 1992, Johnny Bourn was arrested for the rape and murder of an elderly Mississippi woman after Dr. Michael West matched a bite mark on the victim to Bourn. Bourn was imprisoned for 18 months, despite hair and fingerprint evidence pointing to another suspect. Ultimately, Bourn was released when he was excluded as a suspect by DNA testing performed on fingernail scrapings from the victim, but not before he had spent about one and a half years in jail awaiting trial.³⁹
6. **Dane Collins:** In 1989, Dane Collins was arrested and charged with the rape and murder of his 22-year-old stepdaughter, based largely on a bite mark comparison performed by ABFO Diplomate Dr. Homer Campbell. The Sante Fe, New Mexico, District Attorney declared his intent to seek the death penalty. Despite evidence that Collins could not produce sperm and therefore could not have been the perpetrator, the D.A. gave several public interviews stating that while there was not enough evidence to try the case, he believed Collins was guilty of the

³⁷ *Burke v. Town of Walpole*, 405 F.3d 66, 73 (1st Cir. 2005).

³⁸ The Innocence Project, *Cases Where DNA Revealed That Bite Mark Analysis Led to Wrongful Arrests and Convictions*, *supra* n.9; *Otero v. Warnick*, 614 N.W.2d 177 (Mich. Ct. App. 2000).

³⁹ Hansen, *supra* n.14; *Michael West Responds*, THE AGITATOR, Part 167, March 1, 2009, available at <http://www.theagitator.com/2009/03/01/michael-west-responds/>; Paul C. Giannelli & Kevin C. McMunigal, *Prosecutors, Ethics, and Expert Witnesses*, 76 FORDHAM L. REV. 1493 (2007).

crime. Fifteen years later, a man named Chris McClendon was matched to DNA found on the victim. He pled "no contest" to the crime in exchange for describing how he had committed the rape and murder. (McClendon was already serving life in prison after he was convicted of kidnapping and raping a 24-year-old woman.)⁴⁰

7. **Ricky Amolsch:** Ricky Amolsch's girlfriend, Jane Marie Fray, was found dead on August 23, 1994. She had been stabbed 22 times and had an electrical cord wrapped around her neck. The arrest warrant for Amolsch was based on a finding by Dr. Allan Warnick that a bite mark that had been found on the victim's left ear was "highly consistent" with Amolsch's dentition. Charges were not dropped until 10 months later when the eyewitness who had identified Amolsch's van at the crime scene was himself arrested for raping another woman in the same trailer park. Amolsch was jailed for 10 months until his trial. During that time, he lost his home, savings, and children.⁴¹

⁴⁰ Jeremy Pawloski, *Plea in '89 Slaying Eases Parents' Pain*, ALBUQUERQUE J., Aug. 14, 2005, available at <http://abqjournal.com/news/state/380765nm08-14-05.htm>; Jeremy Pawloski, *State Police Say DNA Ties Felon to Slaying*, ALBUQUERQUE J., May 1, 2004, at 2.

⁴¹ Jim Fisher, *Forensics Under Fire: Bite Mark Evidence*, available at <http://jimfisher.edinboro.edu/forensics/fire/mark.html>; Katherine Ramsland, *Bite Marks as Evidence to Convict – Whose Bite Mark is it, Anyway?*, CRIME LIBRARY, available at http://www.trutv.com/library/crime/criminal_mind/forensics/bitemarks/5.html.

Statistical Analysis of Forensic Odontologist Involvement In Cases of Wrongful Bite Mark Convictions and Indictments

The misapplication of forensic sciences is a leading contributing factor to wrongful conviction,⁴² and of the unvalidated techniques that have contributed to wrongful convictions and indictments later overturned through DNA testing, bite mark comparisons pose an acute threat to the reliability and fairness of the criminal justice system. A total of 28 forensic dentists were involved in the 33 known wrongful convictions and indictments secured through the use of bite mark comparison evidence.⁴³ Approximately 79%, or 22, of those dentists were Diplomates of the American Board of Forensic Odontology at the time of their relevant casework, and 91% of the wrongful bite mark conviction and indictment cases involved at least one board-certified dentist.⁴⁴ The raw data is presented below in Chart 1; ABFO Diplomates are highlighted in yellow. A brief statistical summary is offered in Chart 2.

⁴² The Innocence Project, *Unvalidated or Improper Forensic Science*, available at <http://www.innocenceproject.org/causes/unvalidated-or-improper-forensic-science/>.

⁴³ Nine forensic odontologists participated in multiple cases of wrongful conviction and/or indictment. Conversely, several cases involved multiple dentists.

⁴⁴ *American Board of Forensic Odontology Diplomat Information, Updated 8/2017*, available at <http://abfo.org/wp-content/uploads/2017/05/ABFO-Diplomat-Information-revised-August-2017.pdf>.

Chart 1: Wrongful Bite Mark Convictions and Indictments by Odontologist and ABFO Diplomat Status

Forensic Odontologist	Wrongful Convictions and Indictments	ABFO Diplomat Status
1. Lowell Levine	-Keith Harward -Edmund Burke	Diplomate
2. Alvin Kagey	-Keith Harward	Diplomate
3. Lowell Johnson	-Robert Lee Stinson	Diplomate
4. Raymond Rawson	-Robert Lee Stinson -Ray Krone	Diplomate
5. Ira Titunik	-Gerard Richardson -Edmund Burke	Diplomate
6. Robert Barsley	-Willie Jackson	Diplomate
7. Edward Mofson	-Roy Brown	Diplomate
8. Homer Campbell	-Calvin Washington -Joe Sidney Williams -Steven Chaney -Dane Collins	Diplomate
9. Jim Hales	-Steven Chaney	Diplomate
10. Harvey Silverstein	-James O'Donnell	Diplomate
11. Michael West	-Levon Brooks -Kennedy Brewer -Anthony Keko -Johnny Bourn -James Earl Gates -Sherwood Brown	Diplomate
12. Thomas David	-John Kunco -Sheila Denton	Diplomate
13. Michael Sobel	-John Kunco	Diplomate
14. Allan Warnick	-Michael Cristini -Jeffrey Moldowan -Ricky Amolsch -Anthony Otero	Diplomate
15. Pamela Hammel	-Michael Cristini -Jeffrey Moldowan	Diplomate
16. John Kenney	-Harold Hill -Dan Young, Jr.	Diplomate
17. Norm Sperber	-William Richards	Diplomate
18. Richard Souviron	-Dale Morris, Jr. -Gary Cifizzari	Diplomate
19. Kenneth Martin	-Dale Morris, Jr.	Diplomate
20. Lester Luntz	-Alfred Swinton	Diplomate
21. Harry Mincer	-Sherwood Brown	Diplomate
22. Stanley Schwartz	-Gary Cifizzari	Diplomate

23. Russell Schneider	-Bennie Starks	Not board certified
24. Carl Hagstrom	-Bennie Starks	Not board certified
25. Constantine (Gus) Karazulas	-Crystal Weimer -Alfred Swinton	Not board certified
26. Richard Glass	-Greg Wilhoit	Not board certified
27. Keith Montgomery	-Greg Wilhoit	Not board certified
28. Anthony Captline	-Gary Cifizzari	Not board certified

Chart 2: Statistical Summary of Cases of Wrongful Bite Mark Conviction and Indictment

Total Wrongful Bite Mark Convictions and Indictments:	33
Total Years of Wrongful Incarceration (approx.):	424
Total Wrongful Bite Mark Death Sentences:	4
Forensic Dentists Involved in Wrongful Bite Mark Convictions and Indictments:	28
ABFO Diplomates Involved in Wrongful Bite Mark Convictions and Indictments:	22
Non-Board Certified Odontologists Involved in Wrongful Bite Mark Convictions and Indictments Cases:	6
Percentage of Dentists Responsible for Wrongful Bite Mark Conviction and/or Indictments With ABFO Diplomate Status:	78.6% (22 of 28)
Percentage of Wrongful Bite Mark Convictions and Indictments With ABFO Diplomate Involvement:	90.9% (30 of 33)

EXHIBIT B

NORTH CAROLINA
JOHNSTON COUNTY

IN THE GENERAL COURT OF JUSTICE
SUPERIOR COURT DIVISION
10 CRS 3981-82; 54369; 54426

STATE OF NORTH CAROLINA,]
]
]
 vs.]
]
 JONATHAN D. RICHARDSON,]
]
 DEFENDANT.]
_____]

TRANSCRIPT
VOLUME 25
JURY SELECTION
FEBRUARY 14, 2014
[5607-5760]

The above-captioned case coming on for hearing at the January 6, 2014, Criminal Session of the Superior Court of Johnston County, sitting in Harnett County, before the Honorable Thomas H. Lock, Judge Presiding, the following proceedings were had, to wit:

A P P E A R A N C E S

SUSAN DOYLE, DISTRICT ATTORNEY
GREG BUTLER, ASSISTANT DISTRICT ATTORNEY
PAUL JACKSON, ASSISTANT DISTRICT ATTORNEY
11B PROSECUTORIAL DISTRICT
POST OFFICE BOX 1029
SMITHFIELD, NORTH CAROLINA 27577
ON BEHALF OF THE STATE

JONATHAN BROUN, ATTORNEY AT LAW
STATE OF NORTH CAROLINA OFFICE OF THE CAPITAL DEFENDER
123 W. MAIN STREET, SUITE 601
DURHAM, NORTH CAROLINA 27701

MAITRI "MIKE" KLINKOSUM, ATTORNEY AT LAW
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RALEIGH, NORTH CAROLINA 27602
ON BEHALF OF THE DEFENDANT

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DEFENDANT'S EXHIBIT LIST

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1 (The proceedings began at 12:15 p.m., Friday,
2 February 14, 2014.)

3 (The District Attorney, Assistant District Attorneys,
4 Counsels for the Defendant, and the Defendant were present in
5 the courtroom. No prospective jurors were present.)

6 THE COURT: Thank you, folks. Good morning,
7 everyone.

8 MR. JACKSON: Good morning, your Honor.

9 MR. KLINKOSUM: Good morning, your Honor.

10 THE COURT: Let the record reflect the presence of
11 the Defendant, both of the attorneys, the State's attorneys; no
12 prospective jurors.

13 As you folks know, we're here today to consider a
14 couple of motions filed by the Defense concerning two proposed
15 expert witnesses for the State. I think we're going to take
16 up, first, the Defendant motion -- or Defense motion,
17 captioned, "Motion In Limine to Restrict Introduction of the
18 Testimony and Reports of Dr. Richard E. Barbaro." Or Barbaro?

19 MR. JACKSON: Barbaro.

20 THE COURT: Barbaro; I'm sorry. Thank you. And,
21 as I understand, this is essentially a motion to exclude his
22 testimony totally; is that not correct?

23 MR. BROUN: That is correct.

24 THE COURT: Did he prepare a written report of
25 some sort that was provided to the Defense?

1 MR. JACKSON: Yes, your Honor, he did.

2 THE COURT: How long is that report?

3 MR. JACKSON: There are multiple reports which are
4 fairly short. If your Honor would like, I can approach with
5 those.

6 THE COURT: I'd like to look at them first. I've
7 never seen them.

8 MR. JACKSON: And may I also -- I just want to
9 address a practical matter regarding some of the exhibits that
10 I will be distributing, as far as their introduction. I
11 believe, your Honor, I've handed you multiple reports. One is,
12 I think, also, I handed you the Curriculum Vitae.

13 (Mr. Jackson and Mr. Broun confer. Mr. Jackson takes
14 photographs of plaster molds. This is done on Defense
15 counsel's desk.)

16 (Court reviewing documents.)

17 THE COURT: All right. Let me ask a couple of
18 questions, and they -- in the report dated October the 29th,
19 2013, Dr. Barbaro --

20 Am I pronouncing that correctly, now?

21 MR. JACKSON: Yes, sir.

22 MR. BROUN: Yes.

23 THE COURT: -- states in the last paragraph that
24 he believes with a high level of confidence that Jonathan
25 Douglas Richardson made the bite marks. My understanding was

1 the State was not going to be proffering that opinion, which is
2 not in the report stated with any amount of certainty. Rather,
3 you were simply going to have your expert define that there
4 were bite marks on the body. Am I incorrect about that?

5 MR. JACKSON: That was the original thought process
6 and plan, and after speaking with -- that's what I thought was
7 going to happen. After speaking with Dr. Barbaro and when he
8 had an opportunity to conduct a thorough examination of all of
9 the evidence that he had, he was able to render that opinion.

10 THE COURT: What opinion?

11 MR. JACKSON: The opinion that with a high degree of
12 certainty that the Defendant made the bite marks.

13 THE COURT: Has he stated that in the report
14 that's been given to the Defense?

15 MR. JACKSON: Yes.

16 MR. BROUN: Yes, sir.

17 THE COURT: Do you have the report that postdates
18 October 29th, 2013?

19 MR. JACKSON: The opinion is, "I believe with a high
20 level of confidence -- I'm sorry, high level of confidence,
21 that Jonathan Douglas Richardson made the bites marks." That
22 is the opinion. I misspoke. "I believe with a high level of
23 confidence that Jonathan Douglas Richardson made the bite
24 marks."

25 THE COURT: All right, so that's the last report

1 provided to Defense counsel; is that correct?

2 MR. JACKSON: That is correct, yes.

3 THE COURT: All right. Another question, I'm sure
4 you are aware that the General Assembly, a couple years ago,
5 revised Rule 702. And you probably are aware, at least I hope
6 you are, of the opinion of the Court of Appeals that came down
7 about two weeks ago in the case of Charles Anthony McGrady. I
8 don't have a cite, but it's a Wilkes County opinion, and the
9 Court of Appeals opinion number is COA 13-1330, which makes it
10 clear and confirmed what I think we what we already knew, and
11 that is that North Carolina is now a Daubert state, and not --
12 Howerton is no longer the rule in this state. But, I do have
13 question as I read the editor's note to Rule 702. It appears
14 that the new rule is applicable to actions commencing on or
15 after October 1, 2011, so for purposes of this case, does
16 Howerton apply or does Daubert apply?

17 What is the position of the State?

18 MR. JACKSON: This action commenced prior to that,
19 so based upon that statement, the Howerton would apply and not
20 Daubert.

21 THE COURT: Are you sure? What's the position of
22 the Defense?

23 MR. BROUN: That the new rule, which the Court of
24 Appeals has said is now Daubert, applies, and I think that's
25 always been the case where rules of evidence, when they come

1 into effect, it's not when the crime happens, it's when the
2 rules of evidence, particularly when it's one that would adhere
3 to the benefit of the Defendant.

4 MR. JACKSON: And out of abundance of caution, your
5 Honor, the State would not object to proceeding under a Daubert
6 standing -- standard, but I don't know that that is -- I'll
7 leave that in the Court's discretion. We are ready to proceed
8 under both.

9 THE COURT: All right. You said there was
10 something you wanted to discuss concerning exhibits?

11 MR. JACKSON: Yes, your Honor, just as a practical
12 matter. One of things I did, there will be exhibits that will
13 be used that are impressions made from the victim, as well as
14 molds made of the Defendant's teeth. Now, they are somewhat
15 fragile, and so my -- and I talked with counsel about this, I
16 would like for the witness to be able to use them to illustrate
17 to the Court the method, the methodology that he used, and I've
18 taken a picture of them. And so instead of introducing them
19 into evidence, what I would ask is that we make sure that the
20 description is clear for the record, that I introduce a
21 photograph, but I would like for the actual exhibits, because
22 they are fragile, to remain in the care, custody, and control
23 of the expert witness until such time that, if he's allowed to
24 testify in front of the jury, that we would introduce it at
25 that point in time.

1 THE COURT: So for purposes of this hearing, you
2 would merely be offering photographs of the dental impressions.
3 During trial, if your witness testifies, you would introduce
4 the impressions themselves. Is that what you're saying?

5 MR. JACKSON: And I would like for the witness to be
6 able actually use the dental impressions and molds to
7 illustrate to the Court --

8 THE COURT: Sure.

9 MR. JACKSON: -- the -- his methods that he used,
10 but I would not move to -- and I would just move to introduce
11 evidence, photographs of those. But, yes, if that's what
12 you're saying, yeah. I just want to make sure that the witness
13 was able to use them for the Court's purposes.

14 THE COURT: Does the Defense have any objection to
15 that?

16 MR. BROUN: No, as long as it's clear that if we
17 have to deal with this issue on appeal, that the appellate
18 record, since he would then be introducing these during the
19 trial record, that the appellate record on this issue could
20 include the actual model itself. But I think that could be
21 easily done. And I think if they go forward, and the State
22 prevails on its motion, that that would be done. I just want
23 to make that position clear.

24 THE COURT: Well, it would never be an issue on
25 appeal unless the testimony and exhibits are received --

1 MR. BROUN: Yes.

2 THE COURT: -- unless the Defendant -- and unless
3 the Defendant is convicted.

4 MR. BROUN: Right. Right. I understand all of
5 that.

6 THE COURT: The record will be in the record.

7 MR. BROUN: Yes.

8 THE COURT: Okay.

9 MR. BROUN: And that it could be done for those
10 purposes.

11 THE COURT: Yes. For the purposes of our hearing
12 today, you're all right with the Court looking at photographs,
13 and with the witness retaining custody of the original
14 impressions after the hearing?

15 MR. BROUN: Yes.

16 THE JACKSON: The photographs are something that I
17 just took, because I just have -- he just brought them today,
18 and I haven't printed them out yet. I haven't printed the
19 photographs. So what I was planning on doing is not really
20 introduce -- introducing the photographs when I had an
21 opportunity for the record, but -- of what the Court is looking
22 at, if that makes sense. Because I don't have them --

23 THE COURT: So, you don't have photographs for the
24 hearing?

25 MR. JACKSON: I have them on my phone, but I don't

1 have them printed out.

2 THE COURT: But you're going to have the
3 impressions here in the Court today? The witness will be using
4 them to illustrate his testimony, and you propose he be allowed
5 to retain custody; is that correct?

6 MR. JACKSON: Yes.

7 THE COURT: And he has custody of them?

8 MR. JACKSON: Yes.

9 THE COURT: Not you?

10 MR. JACKSON: Well, I do right now, because I'm
11 holding them, but, yes, yes.

12 THE COURT: But I mean pending trial?

13 MR. JACKSON: Yes, he does have custody of them
14 pending trial.

15 THE COURT: All right, anything else for the
16 State?

17 MR. JACKSON: No.

18 THE COURT: Anything for the Defendant before we
19 begin?

20 MR. BROUN: No. No, your Honor.

21 THE COURT: Then whenever you're ready, sir.

22 MR. JACKSON: The State is ready to proceed. The
23 State calls Dr. Barbaro. Barbaro, I'm sorry.

24 DR. BARBARO: Barbaro.

25 RICHARD BARBARO, D.D.S

1 was called as a witness, duly sworn, and testified as follows:

2 DIRECT EXAMINATION BY MR. JACKSON: 12:29 p.m.

3 Q Good afternoon.

4 A Good afternoon.

5 Q Will you, please, state your name for the Court?

6 A Sure. Richard R. Barbaro; B as in boy, A-R, B as in
7 boy, A-R-O.

8 Q And -- is it Dr. Barbaro?

9 A Yes, sir.

10 Q Dr. Barbaro, can you, please, describe for the Court
11 how you are employed at this point in time?

12 A At this point in time, I'm a private practitioner
13 practicing general dentistry in Fayetteville, North Carolina.

14 Q Do you also -- can you, please, tell the Court
15 whether or not you specialize in forensic dentistry, as well?

16 A I -- I don't necessarily specialize in forensic
17 dentistry. I have training in forensic dentistry. And when
18 the Courts and the legal system needs my help, I render that
19 aid.

20 Q Okay. So you have special training and experience
21 with regards to forensic dentistry?

22 A Since 1984.

23 Q If you would, please, can you describe generally your
24 training, education, and experience in the area of dentistry,
25 and any license or certifications that you hold?

1 A Sure. I went to Northwestern University's dental
2 school from 1977; graduated in 1981. I, at that point, had an
3 obligation to the military, and served with the Special Forces
4 group at Ft. Bragg, North Carolina, from 1981 till 1987. It
5 was during that time, because of my deployments overseas, that
6 the group that I was attached to sent me to the Armed Forces
7 Institute of Pathology in 1984, in Washington, D.C., where I
8 spent my -- I spent a week there for the first course I ever
9 had in forensic -- in forensic odontology. The purpose of
10 that, at that point, was to become comfortable with examining
11 bodies, and being able to make dental identifications.

12 Q What is forensic --

13 What was the term that you used?

14 A Odontology.

15 Q -- odontology?

16 A Odontology -- forensic odontology is simply the
17 association between the study of dentistry and the study of
18 law, and how those two relate.

19 Q And so your first exposure to forensic -- is forensic
20 dentistry interchangeable?

21 A They are interchangeable terms. Forensic dentistry
22 and forensic odontology are one and the same.

23 Q So your first introduction to forensic odontology
24 was in the special -- you were in Special Forces?

25 A Right. So, I went to the course in 1984. And

1 actually. I had to deal with a helicopter crash in 1985. When
2 I was going through Special Forces training, I got pulled to do
3 an identification of a Black Hawk crash out at Ft. Bragg, and I
4 believe there were sixteen fatalities.

5 Q Can you -- I'm going to -- in a moment I'm going to
6 talk a little bit more about your education and expertise with
7 regards to forensic odontology, but I would like for you to
8 speak generally about your experience in dentistry generally.

9 A So, I graduated from Northwestern, joined the Army,
10 and have been practicing general dentistry ever since. I have
11 a lot of training in surgery. My job, when I was in the
12 military, was to go overseas and to train Special Forces medics
13 and counterparts in other countries in certain dental surgery,
14 and also to be comfortable with trauma surgery in the event of
15 war, which I never participated in. I was in the service in
16 non-combat times.

17 So, I have a lot of training in general dentistry. I
18 am a fellow of the Academy of General Dentistry, and have
19 memberships in multiple other dental organizations, to include
20 the American Dental Association, the North Carolina Dental
21 Society, the American Academy of Forensic Sciences, the
22 American Society of Forensic Odontology. And there are
23 probably others; I'm not sure.

24 And, so, after that, I have been -- I practiced
25 dentistry in the military for seven years, six and a half

1 years, and now I've been practicing dentistry on my own in
2 private practice since 1987. It is a family practice. I do
3 have associates working for me. Right now I currently have one
4 full-time general dentist working as my associate.

5 Q Over the course of your career as a dentist, how
6 many, would you estimate, how many patients have you viewed, or
7 different sets of teeth have you examined in your career as a
8 dentist?

9 A Sure. It would be very similar to how many briefs
10 has an attorney looked at in thirty or forty years. You know,
11 I see teeth all day long. I see, on a daily basis, probably
12 twenty-five to thirty patients a day on exam and in my room in
13 treatment. And if each person has twenty-eight to thirty-two
14 teeth, it would -- it would tally into the tens of thousands.

15 Q Can you, please, describe for the Court, in a little
16 more detail, your training, education, and experience in the
17 area of forensic dentistry or odontology?

18 A I can. So, when I got out of the military, I -- let
19 me backtrack, and just let you-all know, a forensic dentist in
20 the United States has to work under the supervision of a
21 forensic pathologist/medical examiner. In the old -- in some
22 of the systems, and in Cumberland County, we don't have this,
23 but where they have a coroner system, then a forensic dentist
24 could -- could work under a coroner-based system. Cumberland
25 County has a medical examiner system, and UNC has the, you

1 know, the School of Dentistry there and the medical examiner's
2 officer there. So I don't have the ability to do any
3 identification in Cumberland County, because all -- all
4 identifications are immediately sent to Chapel Hill, where the
5 medical examiner there takes care of that, and has a forensic
6 dentist working under his supervision.

7 In Sampson County, there's a medical examiner who is
8 also a forensic pathologist; his name is Dr. Carl Barr. I do
9 work for him at times, where there are cases of homicide and
10 bite marks. I've never done a child abuse case with him.

11 I have done child abuse cases in Cumberland County
12 because time is of the essence. Whenever we do a -- whenever a
13 child presents to the emergency room and there are suspected
14 bite marks on the -- on the victim, it's a matter of time as to
15 how the bite marks will change. I have testified in court
16 before to the jury, that if you bite yourself really hard to
17 the point of pain, and release, by the time twenty or thirty
18 minutes expires, that bite mark is pretty much gone.

19 But when a child is brought to the ER and the nurses
20 and doctors suspect child abuse with bite mark evidence, then
21 they summon me at the office, and I leave the office to go and
22 take photographs there and start the examination process there.

23 Q With regards to general -- your general education and
24 experience with regards to forensic dentistry, can you describe
25 for the Court how you started that -- your involvement, from

1 the time that you began, till the present, and any training and
2 the expertise you have in that area.

3 A Sure. So, initially, when I started my -- my -- I
4 have a passion for forensic dentistry, because I've always been
5 a strong supporter of the law, and I feel like I can help you--
6 all by -- by at least accumulating evidence and presenting it.
7 So, in 1987, when I got out of the Army, I continued to take
8 classes in forensic dentistry. I went through programs in
9 University of Michigan. I went through the medical examiner's
10 office in Dade County, at Pensacola. I went out to Santa
11 Barbara, California, and took some course work there in digital
12 evaluation of dental evidence. I went to Northwestern
13 University's program on bite marks, where they actually
14 reproduced bite marks in pigskin; which, if you do any
15 research, there is a similarity between, I think the word is,
16 "porcine," but pigskin and human skin. So many studies have
17 been done doing that. And I also have been to some courses in
18 -- through the American Academy of Forensic Sciences in -- in
19 bite mark evidence in mass casualty evaluations, and things
20 like -- and in course work like that.

21 In 1991 I had my first bite mark case. It was a
22 triple homicide at the Heather Ridge Apartments in Cumberland
23 County, in Fayetteville, near Methodist University, where a
24 perpetrator entered an apartment building, and horrifically
25 killed a nineteen-year-old lady, her mother, and brother. And

1 there were four bite marks on the body. The SBI -- I, of
2 course, got involved through the Fayetteville P.D. But the SBI
3 then sent me down to Miami to work with a forensic dentist down
4 there named Dick Souviron, who was the first -- he was a
5 dentist famous for trying, or for being part of the trial of
6 the Ted Bundy murders, the mass suicide -- the mass --

7 What am I thinking?

8 -- the mass murder. Excuse me. The mass murders.

9 Q Did you work and train with him?

10 A I worked with him, and I had recovered all the
11 evidence from the suspect and the suspect pool, and actually
12 went down and presented it to him, and trained under him.

13 And then there was another homicide in Cumberland
14 County, with the sheriff's department at that same time, and
15 this was also the time that DNA was first being introduced into
16 the courts.

17 And then over -- over -- over the course of time,
18 I've dealt with bite mark evidence. Usually I deal with maybe
19 one case a year, or one case every two years, or something like
20 that, where -- where bite mark evidence is either discovered in
21 a hospital setting, or in a couple of cases I've had police or
22 sheriff's deputies bring victims to the office to -- just to
23 examine and to try to evaluate whether or not the dental
24 evidence there is of any evidentiary value.

25 Q Do you still work in that capacity; are you still

1 called upon for --

2 A I still -- I actually have a badge through the
3 Fayetteville Police Department which allows me into crime
4 scenes. I have a badge. It says -- I think it says Police
5 Dentist on it, or Police Physician, something like that. But
6 it's a gold badge. It allows me into crime scenes.

7 Q Have you given lectures or presentations or taught in
8 the area of forensic dentistry?

9 A I actually have. I've lectured at State meetings,
10 the North Carolina State meeting down in Myrtle Beach one year.
11 I've given eight-hour presentations in different cities,
12 Wrightsville and some other cities. I've given a lot of talks
13 to CSI folks in the Cumberland County and Fayetteville area, to
14 -- to homicide detectives. And I have lectured at the local
15 Fayetteville Community College, Fayetteville -- FTI, I guess
16 it's called, Fayetteville Technical Institute. I've lectured
17 out at Ft. Bragg.

18 So, yes, to answer your question, I have lectured and
19 have continued to study. And every time I do a case, you know,
20 you're studying case law, you're staying on top of articles
21 that present themselves through the different journals of
22 forensic dentistry, or really through -- through the Academy of
23 Forensic Sciences.

24 So, it's an ongoing study. It -- you never -- you
25 never stop studying.

1 Q Have you kept up with the developments in the field
2 of forensic dentistry?

3 A I have.

4 Q Through --

5 A Mostly through journal work at this point.

6 Q Have you -- now I'd like for you to talk about not
7 just forensic -- your education, training, and experience with
8 forensic dentistry, but with regard to bite mark
9 identification. Have you had training, education, and
10 experience in that more specific area of forensic dentistry?

11 A Through the -- and both attorneys have a packet of
12 certificates that demonstrate the course work that I've done.
13 So, yes, I have been to several seminars, two-, three-, four-
14 day seminars on the evaluation of bite mark evidence.

15 Q And have you kept up with the methodologies used in
16 the field of forensic dentistry with regards to conducting work
17 in bite mark identification?

18 A I have. I think if you do a review of bite mark
19 evidence, you'll notice that the journals were replete with
20 bite mark analysis all the way through the '90's. You don't
21 see as much of review right now in the journals as there used
22 to be. But I stay -- I always stay current. I get that
23 journal monthly, and examine it for any dental literature, any
24 articles on bite marks and other things, and then review those;
25 usually take them out.

1 Q Have you received specific training with regards to
2 bite mark identification?

3 A Through bite mark workshops.

4 Q And have you ever testified in the Superior Courts of
5 North Carolina with regard to bite mark identification?

6 A I have been tendered an expert in Cumberland County
7 by Judge Len Johnson in a murder case similar to this. It was
8 Arnold Hicks was the defendant, and Colton Muskrat was the
9 victim.

10 Q And did you render opinions with regards to forensic
11 dentistry bite mark evidence in that case?

12 A Yes, I was -- I was subpoenaed for the same testimony
13 that I'm giving here, to -- to evaluate evidence on the victim,
14 and to draw a conclusion as to whether or not the suspect made
15 the bite mark.

16 Q And were you allowed to testify and tendered as an
17 expert witness?

18 A I was accepted by -- I was accepted by the Court.
19 And that was, I think, in 1996.

20 Q And have you -- have there been other occasions when
21 you've testified?

22 A Not in Superior Court, not on bite mark evidence.
23 I've done a lot -- I've probably done twenty to twenty-five
24 bite mark cases. That was the only time I was subpoenaed to
25 Superior Court.

1 Q Have you testified in other areas of forensic
2 dentistry before?

3 A I've been involved in federal court for a malpractice
4 case -- or, actually, a personal injury case, dental personal
5 injury case. And I gave a deposition on a malpractice or
6 negligence case, oh, many, many years ago.

7 MR. JACKSON: May I approach the witness?

8 THE COURT: Yes, you may.

9 BY MR. JACKSON:

10 Q Doctor, I'm going to hand to you what I have marked
11 for identification purposes as State's Exhibit VD -- for voir
12 dire -- 1. Do you recognize what that is?

13 A I do. It's my CV.

14 Q Okay. And does that summarize, generally, your
15 training, education, and experience in the area of dentistry,
16 forensic dentistry, and bite mark analysis?

17 A It does.

18 MR. JACKSON: The State would move to introduce into
19 evidence State's Exhibit VD1 for corroborative purposes.

20 MR. BROUN: No objection.

21 THE COURT: Received.

22 BY MR. JACKSON:

23 Q Doctor, if you would, can you describe, generally,
24 the principles and methods utilized by forensic odontologists
25 with regards to conducting bite mark identification analysis?

1 A Sure. I think the most important thing a forensic
2 dentist needs to do is to identify a shaped -- a shaped -- a
3 shaped wound or pattern injury on the body as one that it could
4 be or is a bite mark. So, you have to eliminate things like
5 whip marks with belts and stuff like that. But -- so when the
6 victim comes to the emergency room, where most of the cases,
7 this is where they're presented, or at a homicide scene, there
8 are patterned injuries on the victim. And so it becomes the
9 pathologist or the medical examiner's responsibility, and the
10 forensic dentist's responsibility, to examine those patterned
11 injuries. They're usually closed ovals, and --

12 THE COURT: Excuse me; what?

13 THE WITNESS: Closed ovals, you know? So -- if they
14 are good, you know, good ones. Sometimes you'll get partial
15 bites. But if you have a very good bite. You have to -- you
16 have to ascertain whether or not it is a bite mark, and so
17 there are class characteristics and then there are individual
18 characteristics. So, a class characteristic would be an oval-
19 shaped pattern injury. A complete bite mark would yield two
20 opposing oval injuries on the body. So, that's the general
21 class characteristic. We look for size. Does it fit within
22 the parameters that would be made by a mouth, for example.
23 Does it fit within the parameters that it be made by a human?
24 Because there are certainly bite marks that are inflicted on
25 victims that are made by animals.

1 And then we start to look for individual
2 characteristics. What's an individual characteristic? Are
3 there any signs in the bite mark that would lead the examiner
4 to think that they were made by teeth? A classic bite mark
5 would have many individual marks left on the skin. And, so, in
6 most of the casework, you see one or two bite marks, some of
7 very poor evidentiary value, and that's troublesome, sometimes.
8 So, you may be able to make a statement or be of the opinion
9 that it was a bite mark, but you may not be able to say that
10 the bite mark was in fact inflicted by the suspect. In this
11 particular case, there are multiple bite marks.

12 BY MR. JACKSON:

13 Q Before we -- I'm going to ask you to talk about this
14 specific case --

15 A Okay.

16 Q -- but I wanted you to talk generally about the
17 methods and principles that are used.

18 A Okay. So, once we get to the -- once we get to
19 individual characteristics, then the methods would be, examine
20 the bite mark and try to figure out what the suspect would look
21 like, what the suspect's teeth would look like. So, you look
22 at the different marks, and you see, are there multiple marks
23 there? So, if there are multiple marks there, that means that
24 the inflictor of the wound would have to have multiple teeth.
25 And if all of the teeth line up, it also offers the opinion,

1 then, that there are no missing teeth. So, sometimes bite
2 marks are made by people who have missing teeth, and so you
3 would see a big gap or a big space on the wound, on the
4 victim's wound, in this case, on the bite mark. And then we
5 look for other things. Are the teeth pointy? Are there points
6 in the bite mark that may indicate that the suspect had a real
7 jagged or pointy tooth. And oftentimes we'll see that in eye
8 teeth, the cuspids, or the canine teeth, those corner arch
9 teeth. Those are the things you see most prominently on a dog,
10 for example.

11 Are the -- does the bite mark have a smooth radius?
12 So, if you have a really good bite mark, for example, and all
13 the teeth are in line, that might indicate that the suspect had
14 braces, or just has a really, really pretty smile, if I can use
15 that term. A nice smile, everything is in alignment. Are
16 there marks on the skin that maybe are contrary to that, that
17 the -- that there are jaggednesses, rotations, things like
18 that, that may start to make you think that the suspect had
19 teeth that weren't in perfect alignment.

20 Q Let me ask you, Doctor, when you identify, with
21 regards to the principles and the methods utilized, once you
22 identify what are human, you believe to be human bite marks,
23 what methods are used to preserve that evidence and compare it
24 to, say, you do have a suspect? What's done?

25 A Well, the literature will show you multiple ways of

1 preserving evidence. If you do any kind of research, you'll
2 see that, actually, after photographing and taking impressions,
3 some forensic dentists and forensic pathologists will go to the
4 extreme of actually cutting the bite mark out of the tissue and
5 preserving it that way.

6 Q Is that a rare occurrence?

7 A I don't know how rare it is, actually, but it is
8 done. It certainly is done. What I do is, I take photographs
9 of the body from afar, and then as I -- so, I get general
10 pictures and then I get very specific pictures, specific
11 pictures of the condition of the victim, and then specific
12 pictures of the patterned injuries that I presume to be bite
13 marks. They are taken with and without scale, and why is that?
14 Because in the analysis of bite mark evidence, it's important
15 to know what the dimensions of the bite mark is so that you can
16 also draw any kind of relationship to the suspect's teeth. And
17 so we use what's called an ABO, which stands for American Board
18 of Odontology, ruler number two, you'll see at many, many, many
19 crime photos, and it has a standardized millimeter rule on it
20 as well as circular diagrams. And those rulers are used to
21 help both crime scene folks bring your photographs down to a
22 one-to-one scale and to try to eliminate as much distortion as
23 is possible.

24 Q What is a -- what do you mean by a one-to-one scale
25 and why is that important?

1 A It's very important because of the distortion value
2 that is possible with any photograph. So, when a photographer
3 is taking a picture, and when I take a picture of a victim's
4 injury, I want to get my camera lense perpendicular to the bite
5 mark, in this particular case. If I'm off angle, then I'm
6 going to skew the photograph. And so it's important that when
7 I do take a picture, I'm trying to be parallel, if you will,
8 parallel exactly to the bite mark, so that the lense and the
9 bite mark are on the same plane. And I use the nurses that are
10 in the room, usually, to help me place the scale in the bite
11 mark and then -- in the field of the bite mark and then take
12 pictures. Obviously, hundreds and hundreds of pictures are
13 taken, and only a few of those are actually good when you're
14 trying to get down to a one-to-one thing.

15 You have to understand that a lot of the cases I'm
16 working on, these people are dying, and they have -- they're on
17 oxygen. And I don't -- I don't like to move them around a lot,
18 because as we move them, then they go into a cardiac challenge.
19 And you'll see that their heart rate goes way up. And so I do
20 the best I can with what I have. Rarely do I turn the victim
21 over, because I just -- I don't want to challenge the cardiac
22 system at all.

23 Q With regards to the method that you just described,
24 are those methods that you were trained on --

25 A Yes, sir.

1 Q -- and are those methods that are relied upon by
2 other experts in the field?

3 A That's -- that's the standard. It's the standard of
4 collecting dental evidence.

5 Q Other than collecting and preserving photographic
6 images of bite marks, if that's a correct term, are there other
7 methods that maybe utilize, other than cutting out the skin,
8 methods utilized to either preserve in another way that type of
9 evidence?

10 A Sure. It's not -- it's not common to be able to do
11 this, but I always do it whenever it presents itself. I will
12 -- if I see a bite mark on a victim that has any kind of three-
13 dimensional value to it, meaning that there's some indentation
14 still on the victim, I will take an impression material and
15 inject it onto the bite mark, and then I'll take a material
16 that usually is present in the emergency room to case or splint
17 fractures, or dislocations, or whatever, and I'll cut that into
18 a square and overlay that on top of the impression material so
19 that it forms the contour of the body from where I took it.
20 And that gives me a very good one-to-one, really. I mean, it's
21 an impression of the bite mark off the skin. So, whenever I
22 have three-dimensional value of a bite mark, I use that
23 technique, because it allows me, at least, to study it. It's
24 one of those things, if you don't do it, you'll never know. If
25 you do it, and it gives you some good evidence, then it's a

1 home run for you. So, I always do it if I have the ability.

2 Q And you're talking about taking an impression of a
3 bite mark?

4 A I am.

5 Q Is that what you're referring to?

6 A I'm taking an impression of the bite mark injury on
7 the body.

8 Q And is that a method and principle that is relied
9 upon by other experts in your field?

10 A Yes, sir. You'll see it in the texts.

11 Q Once -- is there anything else that is typically done
12 with regards to preserving the bite mark evidence, once -- on
13 the victim?

14 A On the victim, excluding the fact that I already told
15 you that some examiners actually bite -- cut the bite mark out,
16 I can think of no others.

17 Q Okay, and again, these are methods that you have been
18 trained on?

19 A Been trained on and used over twenty years, thirty
20 years, whatever it is.

21 Q Are these methods that you've taught, as well?

22 A I've taught to dental students, you know.

23 Q Right.

24 A You know, lectured to, you know, but I'm not in the
25 business of training forensic dentists.

1 Q I got you. Do you work for UNC Dental School? Are
2 you a professor at the dental school?

3 A I am an adjunct professor in the Department of
4 Operative Dentistry, which is the department where fillings are
5 done.

6 Q Okay.

7 A You also have to know, I think, that there are few
8 people in North Carolina that even do what I do. It's --

9 Q With regards to forensic dentistry?

10 A Yes. There is -- I know of one other gentleman that
11 is a member of the Academy of -- American Academy of Forensic
12 Sciences. And the reason I know that is because in previous
13 work, he -- either he or I have been called on to assist the
14 system.

15 Q Does he hold a certification from the --

16 A I think we both hold the similar certifications. And
17 I can't even recall his name; I'm sorry.

18 Q Okay. All right. Once you have preserved the
19 evidence with regards to the victim, can you please describe
20 the principles and methods that are utilized to further conduct
21 a comparison?

22 A Sure.

23 Q Once you have a suspect.

24 A You need a suspect pool. And so what we do, then, is
25 -- in this particular case, we had one primary suspect. We

1 always get a court order or a search warrant. And in this
2 particular case, we --

3 Q I want to talk generally about the method that you
4 would use, and then we'll talk about the specific case.

5 A Yeah, this is generally. I mean, I'm not talking
6 about specifics. Before I can examine a suspect, I need to
7 have the Court's permission.

8 Q Yes, sir.

9 A And, so, we never touch a suspect without a search
10 warrant or without a court order. And in this particular case,
11 we had that, that the detective brought to my office with him.
12 I always -- I treat every suspect that comes to my -- and these
13 suspects come to my office, and so they are rendered the exact
14 same care that anybody in my -- any patient in my office is
15 given. I always ask them to take off the handcuffs. And I
16 always ask permission from the suspect to act on the court
17 order or on the search warrant. I treat them with tender,
18 loving care, and all the respect that I can give any human
19 being. And in this particular -- in any case, I try to provide
20 all my services painlessly. And what -- with all those
21 services, we go over the medical history, we do a gross
22 examination of the face and the body and -- not the body, the
23 face and the mouth, intraorally and extraorally, and then we
24 fit trays and take dental impressions.

25 Q Can you sort out that process of taking dental

1 impressions.

2 A Sure. If you've ever had orthodontics done, you've
3 had these things done all the time. If you ever had a crown
4 done in your mouth, you've had the same procedure done. And
5 it's a procedure where a tray is fitted to your mouth. We have
6 stock trays; small, medium, large, extra large. So, we find
7 the tray that best fits the patient's mouth. And then once
8 we're comfortable with the fit of that tray, we use an
9 impression material. I use an impression material, and I have
10 a lot number on this, if it's required, but it's a --

11 Q What do you mean by, "a lot number"?

12 A I know specifically what lot the impression material
13 I used came from.

14 Q Okay.

15 A And I do that for court purposes, so that attorneys
16 can't challenge whether or not the material I use is of
17 accurate value, you know, so if there was ever a question that
18 the lot number was a bad lot and maybe provided an inaccurate
19 impression, we could research that. So, I use a material
20 that's highly, highly accurate. It's a polyvinyl siloxane
21 material. It's like a rubbery material that's injected into
22 the tray and placed in the patient's mouth. And we took
23 multiple impressions. I use a crown and bridge laboratory.
24 These are the people that are -- their whole purpose in life is
25 to fabricate dental prostheses that have a high degree of

1 accuracy to them, and they do my model work for me so that
2 there is a standard there, a high standard of care, high
3 quality. And they pour the impressions up in a very accurate,
4 hard stone, dental stone. And multiple impressions are poured,
5 and multiple stone casts are made so that we can start to use
6 those casts of the suspect to help analyze his dentition and to
7 draw comparisons between the suspect's dentition, his teeth,
8 and the marks that his dentition, his teeth, would make, and we
9 draw those comparisons to the victim's wounds.

10 Q And this process that you described, is there a term
11 -- is it creating a mold; what is the term?

12 A The terminology in dentistry might be, "dental
13 casts." The impression that we take produces a mold of the
14 teeth. So, you know, probably the most accurate terminology
15 would be dental casts, C-A-S-T-S.

16 Q And is that a method and principle that is relied
17 upon in the field of --

18 A Standard of care.

19 Q Okay. I would like to now direct your attention to
20 this case specifically. And I'd like to ask you to describe
21 for the Court generally, first, how you got involved in the
22 case, and the steps that you took, and the methods and the
23 principles you relied upon to form your opinion in this case.

24 Let me -- but before we can go there, let me ask this
25 question. As a part of forensic odontology, or dentistry, is

1 it important for the forensic dentist to obtain as much of a
2 history as possible regarding the facts and circumstances
3 surrounding any particular event?

4 A I feel -- I used to be on staff at Cape Fear Valley
5 Hospital for twenty years. Whenever I'm called outside the
6 comfort of my own office and I'm examining another patient, I
7 always examine -- I always learn as much as I can about the
8 history of the case. So, if I'm examining a patient, for
9 example, at Cape Fear, I go to the chart room, pull the chart,
10 and I go through the entire chart. I want to know what I'm
11 dealing with. That's also the case with any kind of forensic
12 investigation. So in this particular case, you're called to
13 the hospital immediately. There's no -- there's no opportunity
14 to know what happened until you get there. So, of interest in
15 this particular case was I have five children, five boys. My
16 eldest boy was a senior resident at Chapel Hill in pediatric
17 medicine, and he was on-call the night that Teghan was admitted
18 to PICU under the supervision of Dr. Kenya -- I'm at a loss for
19 her name right now.

20 Q McNeal-Trice; would that be it?

21 A Yeah, that's it, Dr. Kenya McNeal-Trice. And so the
22 issue then became -- I got a phone call and asked if I --

23 This was on a Saturday evening, I believe.

24 -- if I could make the drive up to Chapel Hill to do
25 the investigation. UNC had to work that out with their

1 attorneys to make sure that I was allowed to do the
2 investigation, and their attorneys said it was okay. And I met
3 my son, Dr. Ryan Barbaro, Dr. Kenya Trice -- Dr. Kenya McNeal-
4 Trice, and there were some nurses in the PICU there, and we
5 started our investigation, which was, again, introducing myself
6 to the doctor, having her show me the patient, and then
7 starting the photographic investigation.

8 Q Do -- are you briefed on the facts and circumstances
9 surrounding how a victim was brought to the --

10 A Briefly. Briefly. I mean, it's a very scientific
11 atmosphere. For me, it has to be that way. It's too
12 emotionally distressing to see a child, four-year-old child in
13 this particular case, laying down with tubes in every orifice,
14 on a respirator, and not do anything other than be a scientist.
15 So, my goal, at least this is how I deal with this type of
16 work, is to be a scientist and a scientist only. I have to
17 disassociate myself as a dad and just work the case as a
18 scientist.

19 Q Okay. Describe, if you would, generally -- well, did
20 you ever meet with or speak with a detective in the case at
21 some point in time?

22 A At some point in time, the detective sitting in the
23 room, Detective Snipes.

24 Q Okay. And is that something that you typically you
25 do, and other experts in your field do, after they make their

1 scientific observations, you learn more information through --

2 A Well, the very first thing I do is Google the case,
3 and I look -- I try to get as much information as I can from
4 the news sources. And then in this particular case, I had a
5 phone call from Johnston County, asking if I would do an
6 examination on the suspect, and if we could work out a time and
7 a place, the place obviously being my office, we could work out
8 a time to bring the suspect in around my patient schedule, and,
9 you know, just work the suspect up.

10 Q So, the first step was -- involved your evaluation of
11 the victim in the hospital; is that right?

12 A That's correct.

13 Q Okay, and if you would describe what you did when you
14 were called upon to conduct or to be involved in the case and
15 conduct your examination. Can you describe for the Court what
16 you did, step by step?

17 A Yeah. So, when I was in the hospital, we started
18 examining the body. And, of course, just like any investigator
19 or homicide detective, you know, you start trying to figure out
20 the mechanics of what happened and what the wounds -- what the
21 wounds -- how the wounds present themselves, and what made
22 those marks, you know. And so -- and then we look for --
23 obviously, they called me because they thought there were bite
24 marks there, and so the doctor asked me if I felt that they
25 were bite marks. Obviously, they were bite marks, but she

1 asked me if I agreed, and I did. And then we just started
2 looking at the body, and start -- I -- to reiterate, I tried to
3 not traumatize the victim, or I tried to traumatize the victim
4 as little as possible. I'm obviously traumatizing the victim
5 when I'm moving the child around, but -- so, I look for the
6 best bite marks that I can. And I -- I -- and you've heard me
7 say this multiple times today, I look for bite marks that have
8 the highest evidentiary value. Those are the ones that I'm
9 concentrating on. I take multiple pictures. I think I took
10 over a hundred pictures that night. But I'm looking for the
11 pictures that will support scrutiny in the court system, and
12 those are the bite marks we look at and we photograph the most
13 of. So, what do we do? We take photographs. And we do that
14 painstakingly. I use stools to get on the proper plane to make
15 sure the lighting is right. I use a Nikon camera, and I take
16 photographs.

17 Then I start looking for bite marks that may be worth
18 taking an impression of. And then in this particular case on
19 Teghan, there was a bite mark that I thought was deep enough
20 that it might be recorded by -- under her left breast, that I
21 thought might be recordable, and I took an impression of that
22 as I described before. So, we placed this material called
23 Aquasil, by DENTSPLY --

24 THE COURT: Would you spell that for me, please?

25 THE WITNESS: The material, sir?

1 THE COURT: Yes.

2 THE WITNESS: Yeah. It's A-Q-U-A-S-I-L.

3 THE COURT: A-Q-U --

4 THE WITNESS: A-S-I-L; Aquasil.

5 THE COURT: Thank you.

6 THE WITNESS: It's an impression material, and it's
7 by -- the company that I used was DENTSPLY, it's -- Aquasil is
8 only made by DENTSPLY, and that is a dental company, and it's
9 D-E-N-T-S-P-L-Y. It's a very, very, very accurate material
10 that does not need to be poured up immediately. That's one of
11 the nicest things about it. So it doesn't dry out, which would
12 cause distortion. So, some of the materials that are used in
13 dentistry have to be poured up immediately. If not, they dry
14 out. And there is a huge distortion value to that.

15 So, in this particular case with Teghan, there was a
16 good bite mark that I thought was recordable. I took an
17 impression of that. I packed it with the material, the
18 material used in casting, and I went from there. So, I did --
19 so that impression, as a matter of fact, was useable. I feel
20 it was useable, and so I had that. And then I got there about
21 10:30 at night, on Saturday, and I spent about an hour and a
22 half to two hours with my son, his supervisor, and with Teghan
23 and the PICU nurses who were there.

24 BY MR. JACKSON:

25 Q Can you -- I'd now like for you to talk generally,

1 Doctor, regarding whether or not, when you viewed the victim in
2 this case, whether or not there were sufficient impressions or
3 bite marks upon her that you felt like there was enough
4 information for you to conduct your examination regarding her.
5 Can you talk about, generally, the quantity and quality of the
6 evidence you observed on the child?

7 A You know, this sounds crass, but I'll say it. From a
8 forensic standpoint, it was just the mother of all bite mark
9 cases. There were -- there were just an unbelievable quantity
10 of bite marks. So in previous -- in previous cases that I've
11 worked on or studied, the forensic dentist is hoping for one or
12 two decent -- decent bite marks; not maybe even great bite
13 marks, but decent bite marks that maybe he can or she can draw
14 some good evidence from. This poor girl was covered with bite
15 marks. If you read the pathology report, she had sixty-six
16 bite marks on her. And many, many of those bite marks -- I
17 used on her torso; I never -- I never used any bite marks on
18 her back. Every bite mark that I examined was on her torso,
19 and many of them on her chest that were of good, high quality -
20 - again, I'm sorry to repeat myself -- evidentiary value.

21 Q And can you describe, generally, what you did to
22 preserve? I think you talked about photographs and the
23 impressions. Was there anything that you did to preserve that
24 evidence?

25 A Sure. I have a great relationship with the

1 supervisor of the crime scene labs in the City of Fayetteville,
2 and so after I took those photographs, I made a hard disk of
3 them, and I brought them down to the crime scene -- to the
4 crime lab, and they produced one-to-one photographs for me of
5 the evidence that I took -- photographed.

6 Q And so the methods that you utilized with regards to
7 your collection of the evidence and evaluation of the victim in
8 this case, and the bite marks on her body, were those methods
9 and principles that are relied upon by other experts in your
10 field?

11 A They are. I really make it a point, because I make
12 my money doing dentistry, and that's what I do well, I never
13 try to do things with any kind of sense of mediocrity. I'm not
14 an expert in producing one-to-one photos, so whenever I take
15 photos, and I feel like I'm a good photographer, but when I do
16 take photos -- because we take a lot of photographs in
17 dentistry, but when I do take photos of this import, I make
18 sure that the experts process them so that they are admissible
19 in a court of law.

20 Q And, again, the one-to-one ratio is important why?

21 A Why is it? You'll see on these photographs, if you
22 take a ruler, a millimeter ruler, and hold them up to the
23 photographs that we will admit into evidence, that the
24 millimeter scale on our ruler matches the millimeter scale on
25 the photograph. So, that means that the dimensional quality of

1 the bite mark is as accurate as it can be, and preserved
2 photographically.

3 Q After you made your personal observations of the
4 wounds or bite marks on the victim, and you made the impression
5 and took the photographs, and made sure that they were
6 reproduced at a one-to-one ratio, did -- what, if anything, did
7 you do with regards to the potential suspect in the case? At
8 some point in time were you contacted by the Johnston County
9 Sheriff's Office in relation to this case?

10 A I was, and I'm sorry, I don't know that date offhand;
11 I have it recorded. But, yeah, I do, by Detective Snipes. He
12 and a fellow detective brought Jonathan Richardson to the
13 office.

14 Q Do you see that -- the Jonathan Richardson that you
15 saw in your office, do you see him here in the courtroom today?
16

17 A He is not here in the courtroom. Jonathan
18 Richardson? Is that Jonathan Richardson? I wouldn't know.

19 Q Okay.

20 A It's been three years.

21 Q If I were to tell you that's Jonathan Richardson,
22 would that surprise you?

23 A Would that surprise me that that's Jonathan
24 Richardson? It would -- it would not surprise me. He was --

25 Q Would you need to look at his teeth in order to make

1 identification of him?

2 A I could make that, yeah.

3 Q Okay. And I'm not going to ask you to do that, but
4 at some point in time was Jonathan Richardson brought to you?

5 A Jonathan -- Jonathan Richardson was brought to me.

6 Q Okay, and please describe for the Court what, if
7 anything, that you did when Jonathan Richardson was brought to
8 you.

9 A Sure. As I already discussed, Jonathan came into the
10 office. He was seated in a regular patient dental chair. He
11 was un-handcuffed. And I did what I have already described. I
12 asked Jonathan if he knew why he was in the office, if he was
13 in agreement to having his teeth examined -- photographed,
14 examined, and impressions made.

15 Q Okay. And can you describe the process by which you
16 conducted that examination and made those impressions?

17 A Sure. I used a mirror and explorer, and examined his
18 teeth. And then I took impression trays, as we've already
19 described, and fitted them to his mouth. I took a cartridge of
20 Aquasil by DENSTPLY and injected that material into the
21 impression tray --

22 THE COURT: What was the material called, sir?

23 THE WITNESS: The same that we described, Judge, the
24 Aquasil by DENTSPLY.

25 -- and placed it in his mouth, and let it sit there

1 for about three, three and a half minutes. The working -- set
2 working time is three and a half to four minutes. It's a fast-
3 set material. And then we -- I -- we did that multiple times,
4 I think two or three times on the upper, two or three times on
5 the bottom, and then took many photographs of his mouth, with
6 and without mirrors, and then he was dismissed.

7 BY MR. JACKSON:

8 Q Did -- after you created the -- or did what you did
9 with regards to making an impression or mold of his -- Jonathan
10 Richardson's teeth, what, if anything, did you do? And, first
11 of all -- strike that.

12 Why did you make a mold or these casts of the
13 Defendant's teeth?

14 A Why did I do that? For the examination -- just for
15 why we do what we do. We're trying -- we take impressions of
16 the suspect's teeth so that we can determine whether or not his
17 teeth could have made the bite marks that we on the victim.

18 MR. JACKSON: May I approach the witness?

19 THE COURT: Yes, sir.

20 BY MR. JACKSON:

21 Q I am going to now hand to you what I have marked for
22 identification purposes, State's Exhibit VD, for voir dire, 2,
23 a black box. I'm going to ask you if you could take hold of
24 the black box that is marked for identification for the
25 purposes of State's Exhibit VD-2, and can you -- do you

1 recognize what that is?

2 A This is a box I brought to the Court today to -- to
3 protect some of the materials I used to develop dental
4 evidence.

5 Q Okay. I am going to ask you to open that, and can
6 you please, describe, for the record and the Court what is
7 contained within State's Exhibit VD-2?

8 A This is an impression of the maxilla of the upper
9 arch. For you-all, this is the palate. It's the closed --
10 it's the closed part of your upper jaw. And then these are a
11 recording of Jonathan's teeth, and this particular case, teeth
12 from his upper right second molar to his upper left second.
13 This is the material that you've heard me say over again. This
14 is Aquasil by DENTSPLY. This green thing on the outside is a
15 stock tray. It's a plastic tray that we use. And then this
16 white stuff is just plaster. It's used to help create what we
17 call pristine -- pristine models that will be admitted to
18 evidence, I think they have. So, this is the Aquasil, the
19 material, it's a rubbery material, and --

20 MR. BROUN: Your Honor, may I approach, too?

21 THE COURT: Sure.

22 THE WITNESS: So this is -- this is just the thing
23 that carries the impression material into the mouth, the tray.
24 And then the green stuff is -- there are multiple materials,
25 multiple manufacturers. The important thing is, this is a

1 polyvinyl siloxane. It's a very, very, very accurate
2 impression material that can stand the test of time. It
3 doesn't have to be poured immediately. And this was made of
4 Jonathan's mouth. And if you think about it, it goes in this
5 way, so it's placed into the mouth from front to back. And so
6 this is his upper right molar, coming around his central
7 incisors here and his upper left molar over here. We know this
8 is a maxillary impression because we have a recording of his
9 palate, the roof of his mouth.

10 BY MR. JACKSON:

11 Q Okay, will you please -- are there other items --
12 will you, please, place that back into the box marked State's
13 Exhibit --

14 THE COURT: The outer material is the plaster?

15 THE WITNESS: This was just plaster used by the
16 laboratory to produce the model work that we -- that follows.
17 It's the next step. So, you need an impression first. After
18 the impression, then we pour the positive, if you will, Judge.
19 This is -- this is a negative, and then we pour material in
20 here that produces the positive, the positive model.

21 BY MR. JACKSON:

22 Q Do you pour it, or do you hire someone --

23 A I hired somebody, a professional, to do it. I can
24 pour it, but again, I want a pristine model.

25 THE COURT: Is that plaster of Paris, or --

1 THE WITNESS: This on the outside -- it's like a
2 plaster of Paris.

3 BY MR. JACKSON:

4 Q All right, and that would be a cast taken of the --

5 A Upper.

6 Q Upper. And then did you take a cast of the lower --

7 A The lower, yes. And just for edification, Judge, the
8 plaster is not important. It doesn't make the case. It's
9 there for -- to create something for the Court, you know, just
10 something that's really pretty, okay? But the value of the
11 impression is the green thing.

12 So, then this is a lower impression. And again,
13 you'll -- the difference between the upper and the lower here
14 is where the white is here, would be where the tongue would be,
15 okay? So, that would be where the tongue sits. So it doesn't
16 record something that's not there.

17 Q Okay.

18 A And then exactly the same, this would be placed like
19 this into the mouth, and so, this would be a recording of his
20 lower right molar, and this would be a recording of his lower
21 left molar. And in dentistry, every tooth has a specific
22 number. So we count the wisdom tooth as number one on the
23 upper right side, and it goes to sixteen, and then it drops
24 down to seventeen, over to thirty-two. So, when dentists
25 communicate one to another, if I tell somebody, I'm working on

1 tooth number seven, or eight, or nine, they know which tooth
2 I'm dealing with. So every specific tooth has a specific
3 number.

4 Q With regards to the tooth -- the upper and lower
5 casts, once you created those, you said you sent those to a
6 company to create a mold; is that correct?

7 A Right.

8 Q And have you provided me earlier with a complete mold
9 --

10 A I have --

11 Q -- of the Defendant's upper and lower teeth?

12 A You have those.

13 Q And does that -- those molds, does that just -- can
14 you describe for the Court what the molds do? What did they
15 create?

16 A Sure. Can I show a picture of a mold, maybe? I can
17 show you a photograph of -- so, these are -- this is just a
18 photocopy of the molds that --

19 MR. JACKSON: Let me, just for the record, if I may,
20 I'm going to mark this for identification purposes as State's
21 Exhibit VD-3, and is this a photocopy of the mold that you're
22 talking about?

23 THE WITNESS: Yeah.

24 MR. JACKSON: The State would move to introduce into
25 evidence VD-3 for illustrative purposes.

1 THE COURT: Received.

2 MR. BROUN: For purposes of -- yeah, no objection.

3 THE WITNESS: So, these being the negatives, we made
4 positives out of this by pouring stone into that, and that's
5 what was produced from those.

6 MR. JACKSON: Will you show the Court?

7 (Exhibit shown to the Court.)

8 THE WITNESS: So, these are just -- I use these,
9 also, in relating the anatomy of the teeth to the bite marks in
10 the case. But -- so, this is an upper case and this is a lower
11 case. It's Jonathan's model work, just on a photocopier, but -
12 -

13 BY MR. JACKSON:

14 Q Is that like a reproduction of his teeth?

15 A It's an exact reproduction of his teeth.

16 MR. JACKSON: I'm going to just, if I may, since
17 this was introduced into evidence.

18 THE WITNESS: Yeah.

19 (Mr. Jackson hands up the Exhibit to the Court.)

20 BY MR. JACKSON:

21 Q Now, with regards to -- now, do you have a partial
22 cast in State's Exhibit V-2 -- VD-2?

23 A Is this what you're --

24 Q Uh-huh.

25 A Okay.

1 Q Can you just --

2 A This alone?

3 Q This alone, yes.

4 A Okay.

5 Q If you would please, for the record, describe what
6 you pulled out of State's Exhibit VD-2?

7 A For the record, I pulled out a partial model or cast
8 of Jonathan's lower -- lower arch, lower teeth. So, this --
9 this will give you, Judge, it will give you an idea -- I
10 poured the positive, and if you would, that was sitting inside
11 there. Now, of course, everything was there. I cut this down
12 for purposes to fit what you're about to see. So, when I pull
13 this out, now I have the reproduction of the teeth. So, I trim
14 this down, because with most bite mark evidence, we're really
15 only recording the lower six teeth and the upper six teeth.
16 You just don't see the molars way in the back. You know,
17 you're just getting -- whenever you bite somebody, you're
18 biting with the front of the mouth.

19 Q Okay. All right, and so, is that a partial mold?

20 A This is a partial mold -- well, actually, I produced
21 a full mold and then I cut it back to this.

22 Q Okay, and you -- you made several full molds; is that
23 correct?

24 A I did.

25 Q More than one? And you gave one to me, but that's in

1 Johnston County right now?

2 A Yes, sir.

3 Q And why do you make multiple molds?

4 A Because in a homicide that I did, one of my -- the
5 very first homicide cases I did, I gave the -- I gave the
6 police department the evidence, all the evidence I had, and the
7 evidence -- the police department moved to a new facility, and
8 my evidence was lost.

9 Q They lost your evidence?

10 A Yeah.

11 Q Okay. So, you wanted to make sure that didn't happen
12 again?

13 A Right.

14 Q With regards to the fourth item that is contained in
15 State's Exhibit 7-B, can you generally describe that for the
16 record and for the Court, what is that?

17 A May I introduce a picture or may I -- can I reference
18 a picture, if I may? This is the picture I wanted.

19 MR. JACKSON: I am now handing you what I have
20 marked for identification purposes as State's Exhibit VD, for
21 voir dire, 4. Do you recognize what that is?

22 THE WITNESS: (Turning himself toward the bench to
23 speak to the Court.) This was --

24 COURT REPORTER: Doctor? Excuse me.

25 MR. JACKSON: Doctor, Doctor --

1 THE WITNESS: I'm sorry, yeah, yeah, yeah. I'm
2 sorry.

3 BY MR. JACKSON:

4 Q Doctor, before I ask you to show it to the Court, do
5 you recognize --

6 A Okay.

7 Q -- what has been marked for identification purposes
8 as State's Exhibit VD-4?

9 A I do. I recognize this as a photograph, I believe
10 from the -- I don't know if I took this picture or if this came
11 from -- anyway, it's a photograph of Teghan's upper body.

12 Q Do you recognize the marks and the injuries and the
13 bite marks on that particular photograph?

14 A I do.

15 Q Would that help to illustrate your testimony to the
16 Court with regards to how you conducted your analysis of the
17 case?

18 A Yes. This -- this photograph here has multiple bite
19 marks on it. And the purpose of this photograph today is for
20 me to show you the location of the impression of the bite mark.

21 MR. JACKSON: State moves to introduce into evidence
22 State's Exhibit VD-4 for illustrative purposes.

23 THE COURT: Received.

24 BY MR. JACKSON:

25 Q If you would, using State's Exhibit VD-4, can you

1 please describe what, if anything, you did with regard to
2 Teghan's body, and any impressions you may have made of her
3 body when you were at the hospital?

4 A So, this is the impression -- this is the bite mark
5 that I impressed off of Teghan's body. It's under her left
6 breast.

7 Q And for the record, are you utilizing State's Exhibit
8 VD-4, the photograph?

9 A I'm using State's Exhibit VD-4.

10 Q Okay, and if you'll show the Court, and if you can
11 describe for the record where that injury was located that you
12 took the impression?

13 A Under her left breast. And you can see this one
14 here.

15 MR. JACKSON: You can just hand that to the Court,
16 since it's been introduced.

17 (Court reviews photograph.)

18 BY MR. JACKSON:

19 Q And you also have in your hand an item that was
20 removed, the fifth item that was removed from State's Exhibit
21 VD-2. It is green in color and it looks like it is attached to
22 a cloth. Can you describe what that is?

23 A Sure. So, this is the impression we've been speaking
24 about that I took of Teghan's left -- of a bite mark under
25 Teghan's left breast. The green material is the impression

1 material by DENTSPLY, called Aquasil. The white stuff is the -
2 - if you feel it, it's a casting material that hardens in -- it
3 will be in air. You don't have to put water or anything on it.
4 You take it out of a bag and mold it to the area that you're
5 trying to cast or trying to reinforce, and then -- so, after I
6 inject the green impression material onto the bite mark, I then
7 take this material and place it on top of that, and let that
8 material --

9 Q Are you talking about the white cloth-like --

10 A The white cloth. I let the white cloth sit over the
11 impression material until it hardens, and that way, I can
12 ensure against -- ensure against distortion.

13 Q Okay. And the methods that you use to take that
14 impression of the bite mark on the victim, are those -- do you
15 use the methods and procedures that are relied upon by other
16 experts in your field?

17 A I do.

18 MR. JACKSON: Okay, and -- thank you for right now.
19 We'll come back to those in a minute.

20 And for the record, your Honor, I have taken
21 photographs of each of the items contained in State's Exhibit
22 VD-2, and I will provide those for the Court for purposes of
23 the record.

24 (Documents shown to Defense counsel.)

25 BY MR. JACKSON:

1 Q I am now going to hand to you what I have marked for
2 identification purposes as State's Exhibit VD-5, for
3 identification purposes. And you were describing your
4 observations and the procedures that you conducted with regard
5 to the injuries that you noticed on Teghan Skiba. Did you
6 prepare a report at some point in time, just sort of
7 documenting, generally, those procedures?

8 A Yes, I did.

9 Q And do you recognize what the document that has been
10 marked for identification purposes as State's VD-5?

11 A I do.

12 Q What is that?

13 A This is just a preliminary report from my examination
14 of Teghan at the PICU at UNC-Chapel Hill.

15 Q Okay, and does it describe, generally, what your
16 observations and the procedures that you conducted, that you've
17 previously described here in court?

18 A It does. One of the things that we do whenever we
19 examine a victim's body is we try to diagram the injuries on a
20 piece of paper that -- it's like a -- it's just a diagram of a
21 body. What we try to do is record the injuries on that
22 diagram. And in Teghan's specific situation, there were so
23 many injuries there, that we could not diagram them, so we had
24 to rely on photographic records. And so what I did in this
25 particular report was to try to at least document that I

1 examined the child at PICU in UNC-Chapel Hill. There were
2 many, many injuries, and I described some of those injuries in
3 this report, and asked that the -- that readers of the report
4 refer to photographs instead of to diagrams.

5 Q Did you also in that report document taking an
6 impression of the --

7 A Yes, I did. At the bottom, it says, "Multiple
8 photographs were taken with and without a ruler. One
9 impression was made of a bite mark below her left nipple."

10 MR. JACKSON: State would move to introduce into
11 evidence State's Exhibit VD-5 at this time.

12 MR. BROUN: Excuse me, which one is that?

13 (Mr. Jackson and Mr. Broun confer.)

14 THE COURT: Is that report dated September 19th,
15 2013?

16 THE WITNESS: It is, Judge.

17 THE COURT: Received.

18 MR. JACKSON: Thank you.

19 BY MR. JACKSON:

20 Q And so that was just documenting the -- your
21 procedures with regards to what you observed and what you did
22 with regards to the victim when you went to the hospital; is
23 that right?

24 A That's correct.

25 THE COURT: Give it to the Clerk. Mr. Jackson?

1 MR. JACKSON: Yes, sir?

2 THE COURT: You can give it to the Clerk.

3 MR. JACKSON: Okay, thanks.

4 BY MR. JACKSON:

5 Q Did you also prepare a report with regards to your
6 interactions with the Defendant, dated October the 15th of
7 2013, just generally describing your observations of the
8 Defendant and what you did?

9 A I did.

10 Q I am now going to hand to you what I marked for
11 identification purposes as State's Exhibit Voir Dire, or VD, 6.
12 Can you tell the Court whether or not you recognize the
13 document that has been marked for identification purposes as
14 VD-6?

15 A Sure. This is just a report telling -- just
16 describing the fact that Jonathan presented to the office on
17 July 19th, with Detective Snipes and an accompanying search
18 warrant, and we had permission via the search warrant to do
19 exams, take impressions, and make photographs, which we did
20 with Mr. Richardson's approval.

21 MR. JACKSON: Okay. The State moves to introduce
22 into evidence State's Exhibit Voir Dire or VD-6.

23 THE COURT: That's the report dated October 15,
24 2013?

25 MR. JACKSON: Yes, your Honor.

1 THE COURT: Received.

2 BY MR. JACKSON:

3 Q Can you -- Doctor, if you would, please, describe,
4 generally, what you're looking for when you make an impression
5 of a suspect. Can you describe, generally, what you're looking
6 for with regard to unique identifying characteristics?

7 A Sure. I think we alluded to this earlier, but when I
8 look at a suspect, I look at, one, what is the condition of his
9 mouth; two, what are the conditions of his teeth? Are there
10 any unique characteristics, individual characteristics, present
11 in his mouth that may make a unique mark, in this case, a bite
12 mark on the victim.

13 Q Can I just ask you something real quick?

14 A Sure.

15 Q Generally, in your training, education, and your
16 experience over the many years, can you talk about whether or
17 not people have unique characteristics regarding their teeth?

18 A Sure. Truly, in the thirty-plus years of dentistry,
19 I truly don't believe that anybody has the exact same teeth;
20 that nobody in this room, nobody in this world, has the exact
21 same teeth. Why is that? Because even in studies of identical
22 twins, everybody does different things. They eat different
23 foods, they play different sports, they grind their teeth. So,
24 through individual -- through individual habits and just
25 through wear and tear, and we call that attrition, people's

1 teeth change over time. And so you may be an athlete and break
2 a front tooth. So, those are -- those are things that make
3 somebody's teeth different from somebody else's. Alignment is
4 another thing that makes somebody's teeth different from
5 somebody else's. So, somebody's teeth may be perfectly
6 aligned, and somebody else's may have rotations or over-bites,
7 under-bites, things like that. I'm sure you've seen
8 photographs of movie stars with spaces in between their front
9 teeth. Those spaces are calls diastema. If somebody has
10 spaces in between their front teeth, they will record a
11 different dental bite mark than somebody who doesn't have any
12 spaces whatsoever. Some teeth are very crowded together. Some
13 are rotated in, some are rotated out. Some are broken, some
14 are not. Some -- not all teeth fit on the same plane. What do
15 I mean by that? If you were to take a ruler and lay them
16 across the biting surfaces of your front teeth, that doesn't
17 necessarily mean that every single front tooth would hit the
18 ruler at the exact same time. Some teeth may be longer than
19 others. What's the significance of that? If a tooth was
20 longer than the one next to it, when you bit with the same
21 amount of pressure, the longer tooth would make a deeper
22 impression, a deeper indentation. We look for those kinds of
23 things. A very pointy tooth will make a very sharp, round
24 indentation; whereas, a blunted tooth will not. So, we look at
25 the width of the teeth, and so if a bite mark is made and it

1 clearly shows that the width of that tooth was nine millimeters
2 wide, then somebody in a suspect pool with a tooth that was
3 four or five millimeters wide would be excluded or eliminated
4 as the perpetrator, because his or her tooth was much smaller
5 than the bite mark recorded. So, those are some of the general
6 things that I use.

7 So, I look at -- I look at the suspect's teeth, and I
8 imagine what the bite mark would have to look like from that
9 person's teeth, from that person's dentition, and then
10 comparisons are drawn and comparisons are made that way.

11 Q With regards to the dental study models that were
12 produced from the Defendant, Jonathan Richardson, did you make
13 a general report regarding some of the unique characteristics
14 with regards to this Defendant's teeth?

15 A I did make that report and --

16 MR. JACKSON: May I approach the witness?

17 THE COURT: Yes.

18 BY MR. JACKSON:

19 Q I'm going to hand you what I've marked for
20 identification purposes State's Exhibit VD-7, marked October
21 15th, 2013, Forensic Dental Examination of Dental Study Models
22 of Jonathan Douglas Richardson. Do you recognize what that --
23 what the document that's marked for identification purposes as
24 State's VD-7 is?

25 A A report that says, Forensic Dental Examination of

1 Dental Study Models, which were generated from the impressions
2 made.

3 MR. BROUN: Your Honor, just for the record, we
4 understand this is a voir dire hearing, but this the type of
5 opinion that we are specifically objecting to.

6 THE COURT: I understand. For purposes of voir
7 dire, the objection is overruled.

8 BY MR. JACKSON:

9 Q You may proceed.

10 A Forensic dental examination of dental studies, study
11 models that were generated from the impressions that we made of
12 Jonathan's mouth, and basically, what I have done is I've
13 detailed the specifics of the top front teeth and the specifics
14 of the bottom front teeth, because as I've already reported,
15 that those are the biting surfaces that we -- that are
16 recordable in most dental -- in most dental bite mark injuries.
17 We're looking at the top front teeth from cuspid to cuspid, and
18 the bottom front teeth from cuspid to cuspid.

19 When I looked at Jonathan's teeth, I just merely
20 described on paper, on this report, what each tooth looked
21 like. Why did I do that? Because it would help me -- it would
22 help me know what I needed to be looking for in the victim's
23 bite mark, and then to draw similarities and potentially
24 conclusions.

25 Q And what, if you would, generally, did you document

1 or note regarding the Defendant's teeth, and maybe unique
2 characteristics thereof?

3 A Well, there are a lot of unique characteristics.
4 Certainly, the one thing that I recorded on both the victim and
5 in the suspect were the widths of the teeth. The widths of the
6 teeth in the bite mark were of those made by an adult. The
7 widths of the teeth were wider than we would see in a child,
8 for example. There was no spacing, which we always see with --
9 ninety-nine percent of the time, we'll see spacing that's
10 called primate spacing on the teeth of kids under six years
11 old. And in this particular case, I measured -- I measured
12 Jonathan -- the width of Jonathan's upper and lower incisors.
13 I noticed that tooth number eight, which is your right front
14 central incisor, so if you go under your right nares, your
15 right nose, and you feel that tooth, that's tooth under eight.
16 That tooth was significantly longer than the other central
17 incisor. Why is that significant? Because in a bite mark,
18 then, the depth of the bite made -- the bite -- the depth of
19 the mark made by a longer tooth would be deeper on -- in the
20 tissue.

21 What was really, really interesting here -- well, two
22 other things on the upper arch were of interest that the
23 lateral incisors, which are the side teeth, one tooth to the
24 right and one tooth to the left of those two central incisors,
25 they were off plane. So if I took a ruler from cuspid to

1 cuspid and I held the teeth up against a ruler, the lateral
2 incisors on both sides were above the biting surface. Well,
3 what significance is that? They would not record as deep an
4 impression in the skin or in anything, but in this specific
5 bite -- in this particular case, was the skin.

6 I think the two things on the lower arch that were of
7 an extreme evidentiary value were the two lower central
8 incisors were rotated inward. And so instead of having that
9 perfect line that we might see, we could see the rotation of
10 both front teeth, which would cause a v-shaped indentation in
11 the skin, and that made it very, very unique, but also very --
12 it made it easier for me to orient -- to orient all the bite
13 marks as to whether they were made by the upper or lower teeth.
14 It also made it easier for me, in my studies, to determine what
15 teeth I was looking at when I was looking at a specific bite
16 mark.

17 MR. JACKSON: The State would move at this time to
18 introduce into evidence for the purposes of this hearing,
19 State's Exhibit VD-7.

20 THE COURT: Received.

21 BY MR. JACKSON:

22 Q Now, after you conducted your examination of the
23 victim at the hospital and you made your impressions, after you
24 conducted your examination of the Defendant in your office and
25 you made the dental casts, can you please -- and then created

1 the mold; is that correct?

2 A Yes, sir, molds, casts. Yes, sir.

3 Q Please describe for the Court, what, if anything,
4 that you did with regards to conducting a comparison of the
5 evidence that you obtained from the Defendant and the evidence
6 that was obtained from the victim.

7 A I think it would be easier to make -- to explain that
8 if we could look at something I provided to you in the
9 worksheet.

10 MR. JACKSON: Sure. May I approach the witness?

11 THE COURT: Yes.

12 (Mr. Jackson and Mr. Broun approach witness stand.)

13 BY MR. JACKSON:

14 Q I am now going to mark for identification purposes a
15 folder, VD -- State's Exhibit VD-8, work notes, Teghan Skiba,
16 Jonathan Richard. Some of the contents of this folder have
17 already been introduced into evidence. But I'm going to ask
18 you generally to describe what is the contents of State's
19 Exhibit VD-8, what's been marked, just generally, not --

20 A Sure, generally, yeah. So, this isn't a quick and
21 easy process. On the paperwork that you see right here in
22 front of you --

23 Q First -- I'm sorry, let me just. First, will you
24 just generally describe what is contained --

25 A Okay, sure.

1 Q -- and just leaf through each of the items there, and
2 if you'll just generally describe what is contained in VD-8?

3 A Okay. Generally, in VD-8, is working -- copies of
4 working notes that I've been using to evaluate the victim's
5 bite marks and the suspect's teeth.

6 Q And would the contents of State's Exhibit VD-8 help
7 to illustrate your testimony, along with the contents of VD-2,
8 which has already been introduced into evidence? Would it help
9 to illustrate your testimony regarding your -- how you
10 conducted your comparison?

11 A Yes.

12 MR. JACKSON: All right. State moves at this time
13 to introduce into evidence State's Exhibit VD-8 and its
14 contents for illustrative purposes.

15 THE COURT: Received.

16 BY MR. JACKSON:

17 Q Now, Doctor, if you would, utilizing the notes that
18 are contained within -- you said that would help to illustrate
19 your testimony as far as your comparison?

20 A It would, yes. Just to answer at least the last
21 question, and the last question was how do I make -- how do I
22 make the comparison or how do I draw a comparison through
23 analysis, and there, in this -- in this folder, you will see
24 pictures of Jonathan, Jonathan's teeth.

25 Q If you'll show the Court. If you'll illustrate to

1 the Court your testimony.

2 A Judge, this is a picture of Jonathan's teeth, and you
3 can see some of the characteristics of his teeth. There are
4 multiple pictures here from autopsy, and that I did not take,
5 obviously, and there are pictures in here, multiple pictures in
6 here of photographs I did take in the PICU at UNC of bite
7 marks.

8 Q Will you show those to the Court as you're describing
9 them?

10 A So, I'm showing the judge a picture of some of the
11 work that I've done to try to make a comparison between the
12 victim's bite mark and the suspect's teeth.

13 (Witness showing photograph to the Court.)

14 And what I have done here, folks, is I have drawn
15 lots of different lines, trying to illustrate different points
16 of comparison, different unique characteristics.

17 Q Let me ask you, did you find unique characteristics
18 with regards to the Defendant's dental molds or impressions,
19 and the photographs and the impressions that you made of the
20 victim? Did they match?

21 A There's a -- very consistently, yeah, they did match.
22 You know, I measured the width of the central incisors. I
23 looked for the rotation of the lower interiors. I looked for a
24 lack of or a shallow indentation that should show because his
25 upper lateral incisors were not on plane. I looked for a

1 deeper indentation from his longer right central incisor, which
2 I found. And I looked at radius, the radius being whether or
3 not his -- the general shape of the radius or arch of his teeth
4 would match the radius or arch of the wounds inflicted, the
5 victim's bite marks.

6 And so I'm looking here at rotations, I'm looking at
7 length, I'm looking at radius. I'm looking at presence of
8 teeth, crowding. And if you look at this page, and I know you
9 will, you'll see, I don't know, ten, twelve points of
10 comparison here.

11 Q Okay, and the unique characteristics that you noticed
12 from the Defendant's mold of his teeth or the cast of his
13 teeth, did you find those -- you said that you sort of imagined
14 what those would look like. Did you find those unique
15 characteristics on the victim's -- the photographs of the bite
16 marks on the victim as well as the cast or the impression that
17 was taken?

18 A Sure. The evidence taken from Teghan and the
19 impressions and casts made from Jonathan allowed me to draw a
20 high -- just a high value of comparability. I just think
21 they're very consistent with one another.

22 Q Okay, do they match?

23 A They match. I mean, there's such uniqueness in the
24 bite and there's such uniqueness in Jonathan's teeth, that I
25 truly believe that that's consistent one with the other.

1 Q Will you, please -- can you illustrate what you're
2 talking about, and show his Honor these unique characteristics?
3 Did you utilize the --

4 A I can.

5 Q -- for example, the impression and the molds that you
6 took of the Defendant, use those with the pictures as well as
7 the impression?

8 A I can. So, what I'm going to show the -- his Honor
9 is that the cast that I have of Jonathan, the partial cast of
10 the lower teeth and some of the pictures I have here.

11 (Mr. Jackson and Mr. Broun go up on witness stand at
12 bench.)

13 (Witness turns to speak to the Court.)

14 So, if I'm allowed to testify at trial, we'll have
15 those --

16 COURT REPORTER: Louder, please. Just a little
17 bit louder.

18 THE WITNESS: Okay, okay. So --

19 COURT REPORTER: You don't have to speak into the
20 mike.

21 THE WITNESS: Okay. So, I don't have present
22 the model work. That is currently in Johnston County. But we
23 do have at least the lower arch. And if you'll look here,
24 you'll see how those two lower teeth are canted in, and that's
25 significant in this particular case. The two central incisors,

1 rather than being straight across, are like this. And so
2 consequently, when I'm looking here -- when I'm looking here, I
3 can see a cant in here, a cant in here. So, I'm looking at the
4 lower arch and I can see a cant. And I don't want to draw on
5 this. I can see -- I drew it on here. I can see a cant in
6 here and a cant in here, which --

7 BY MR. JACKSON:

8 Q What do you mean by, "a cant"?

9 A A cant; instead of it being straight across like
10 that, these teeth are canted in, inward. And I can see that on
11 the bite mark, illustrated by that photograph, for example.

12 So, those are the -- those are some of the ways I'm
13 using to at least draw the relationship and the conclusion in
14 this respect that these teeth made those bite marks.

15 Q Were there other points of comparison that you could
16 illustrate using --

17 A Not with this cast. I can using -- using the casts
18 that I don't have with me right now.

19 Q Okay.

20 A But, yes, I can by showing you that, for example,
21 tooth number eight, here, it's black and blue. If you look at
22 that bite mark there, the mark is more black than the one next
23 to it, and it's because that tooth is longer. And you can see
24 that if you look at this photograph --

25 Q Which is -- for the record, could you describe what

1 that photograph is?

2 A Okay. This photograph is a photograph of the front
3 of Jonathan Richardson's teeth. And if you look at this, this
4 is tooth number eight, and it's longer than tooth number nine.
5 It also demonstrates here that the lateral incisors, tooth
6 number seven and tooth number ten, are out of plane, so they're
7 not going to record as deep an indentation when they bite. So,
8 I'm looking at this specific tooth, here, which is longer.
9 You'll see in the cast that this tooth, number nine, sticks out
10 farther from the arch, and it also is a characteristic that I
11 can see, just in this particular mark, that tooth number nine
12 sticks out a little bit on the back side from that mark.

13 So, there are many characteristics, but it will be
14 easier to show with models of Jonathan's teeth.

15 Q With regards to the impression that you took of the
16 bite mark from the victim, can you illustrate using the mold
17 and that impression --

18 A Oh, yeah.

19 Q -- your findings and conclusions regarding that?

20 A So, now I'm going to show the impression of the bite
21 mark taken from Teghan's left breast, or under her left breast.
22 And what I did was -- what I'm looking at here is radius, for
23 one. Could this mark -- could these teeth make the mark that I
24 took from the victim's body? And what I've done, what I've
25 done here is I've just -- I've just taken the teeth and laid

1 them on a reproduction of her skin, and I've pushed them
2 forward. And the radius, to me, is spot on.

3 Q Will you show that to the Court?

4 (Witness showing the Court.)

5 (Witness turned to speak to the Court.)

6 THE WITNESS: This is --

7 COURT REPORTER: I can't hear you.

8 THE WITNESS: I'm sorry. Yeah, this is his
9 lower jaw, and this is impression taken under Teghan's left
10 breast. And I'm looking for radius. And what I did is, I laid
11 this on a reproduction of her skin, and I pushed it forward,
12 and things line up.

13 BY MR. JACKSON:

14 Q Other than the radius, you said, "things line up."
15 Can you explain or illustrate the other characteristics that
16 line up?

17 A Sure. The things that -- not only is the radius
18 correct, but it looks to me like the incis -- like the cutting
19 surface, the incisal edges of the lower incisors match the
20 indentations made on the skin.

21 Q With regards to the teeth that are, I guess, canted,
22 does -- can you see that on the impression, as well?

23 A Just -- if you look -- and this is hard to -- I can
24 see it, but what's more important is every -- all the points
25 line up. That's the more important thing.

1 Q All the points line up?

2 A All the points line up.

3 Q Do the -- the mold that was taken from the Defendant,
4 does that match exactly the impression that was taken from --
5 or match consistently?

6 A It matches consistently.

7 Q Okay.

8 A I wouldn't say, "exactly," but the match is very
9 consistent.

10 Q And when you say you couldn't say, "exactly," can you
11 explain why you can't say, "exactly"?

12 A Because -- the thing with bite mark evidence is the
13 skin moves. And so if you take a static piece of wax and you
14 take -- and you take a straight edge ruler, or a straight edge
15 screwdriver, or a flat-head screwdriver, and you push the flat-
16 headed screwdriver into a piece of wax, you're going to get an
17 almost identical recording of that. Now, let's take a knife, a
18 serrated knife, for example, and put it into skin and move it.
19 You're not going to get the exact same mark of that knife that
20 you are in the skin, because things are moved. Well, teeth are
21 tools. Teeth, for all intents and purposes, are little knives.
22 And when they pierce the tissue, the victim isn't standing
23 still or sitting still or lying still. There's movement
24 between the victim and the suspect, so there is that
25 distortional value. You will get, potentially, a wider imprint

1 in the skin as that one tooth is moving side to side or back
2 and forth. So, it's not a static impression of a static
3 object, it's a dynamic impression of a moving object. And, so,
4 that's where there is a distortion value involved.

5 Q Let me -- with regards to the comparisons that you
6 made with regards to the photographs of the bite marks on the
7 victim and the impression on the victim, and the Defendant's
8 mold, did you just use one bite mark or did you have multiple
9 bite marks upon which you were able to make your conclusions
10 and comparisons?

11 A Multiple, multiple bite marks. And, I'm sorry, at
12 this point I do not have the exact number of bite marks that I
13 used to make this analysis. I will -- I can have, but I don't
14 have.

15 Q What is the significance, Doctor, of the fact that
16 you were able to compare not just one bite mark, but multiple
17 bite marks?

18 A Well, a couple of different things. One, it relates
19 to the consistency of the evidence. So, if I -- if I see the
20 same thing over and over again, it tells me, one, that the same
21 person made multiple bite marks, so the same -- the same mouth
22 made those -- made those impressions in the skin. It also
23 helps me -- in most bite mark cases, you're really -- you're
24 really working hard to look for evidence in one -- in one or
25 two bite marks. In this case, I can consistently duplicate my

1 findings in more than one bite mark. And I think that's of
2 forensic value, because what I see on -- in one location, I
3 also see in another location. So there may be some distortion,
4 and I grant you that there's probably a little distortion here,
5 and there has to be.

6 The good thing that I found here is, if somebody
7 bites somebody on a biceps, which sometimes you'll see, or on a
8 breast, for example, there's enough movement in that soft
9 tissue, or in the muscular tissue of a biceps, that you'll get
10 quite a bit of distortion. But if you're on a buttocks or on a
11 chest, for example, and the chest of a pretty lean young lady
12 in this particular case, a four-year-old child, there is not a
13 lot of distortion, because the recording tissue here doesn't
14 have a lot of room for movement. Hence, there's not a lot of
15 room for gross distortion. So, in an impression taken on her
16 chest, for example, and on her back, although I've said that no
17 studies were done on any bite marks from her back, there's much
18 less distortion than you would find, say, on a thigh or a
19 biceps.

20 Q Does that help to make your findings and conclusions
21 more reliable?

22 A Much more reliable.

23 Q Can you talk about classifications of a bite -- did
24 you also examine the victim to determine the different
25 classifications of bite marks --

1 A Sure.

2 Q -- I guess related to the severity?

3 A I can, yeah.

4 THE COURT: Mr. Jackson? Excuse me, one second,
5 Doctor. How much more do you have?

6 MR. JACKSON: I'm getting close to the end.

7 THE COURT: Well, how much more do you think you
8 have?

9 MR. JACKSON: Twenty minutes, ten minutes.

10 THE COURT: About a ten-minute recess, folks.

11 (The Court recessed at 2:08 p.m.)

12 (The proceedings resumed at 2:21 p.m.)

13 (The Assistant District Attorneys, Counsels for the
14 Defendant, and the Defendant were present in the courtroom. No
15 prospective jurors were present.)

16 THE COURT: All right, you may continue.

17 MR. JACKSON: All right, thank you, your Honor.

18 BY MR. JACKSON:

19 Q And I'm going to try to move it along, Doctor. But
20 with regards to the -- were you able to -- did you form any
21 opinions with regard to the different classes of bite marks
22 that you saw on the victim, and can you describe what you're
23 talking about, the classes?

24 A Sure. There are basically in the literature two
25 different kinds of classifications in the American Board of

1 Forensic Odontology. They classify bite marks, they don't call
2 them class ones, twos, threes, or fours, but what they do, in
3 presenting evidence, is discuss whether or not there were
4 lacerations, evulsions, those types of things.

5 I think in the court system, it's easier to describe
6 to the jury the Northwestern University Dental School bite
7 classification system, which goes from class I to class V.

8 A class I bite mark in the Northwestern system is
9 basically a mark, an oval-shaped mark on the skin. Think about
10 a hickey, you know, where you might see a hickey on -- left by
11 a lover or something, where you can tell it was left by the
12 mouth, but there are no dental identifiers there.

13 A class II bite mark would be one where if you bit
14 yourself as hard as you could right now, by the time you folks
15 were done with me, that bite mark would be gone. And so a
16 class II is painful bite. It does record dental -- dental --
17 the teeth, dental evidence, but it not so severe that it will
18 last for very long. You know, and most times a class II,
19 quote/unquote, "class II" bites last twenty to thirty minutes,
20 something like that.

21 But again, I want to emphasize, if you bite yourself
22 as hard as you can right now, you will let go, and that's a
23 class II bite.

24 A class III bite is where the skin has been broken.
25 And so we will see scabbing in a class III bite. So the bite

1 has been made, there are dental indentations, but the force was
2 severe enough that it broke the skin. And so sometimes when
3 we're doing course work, we'll see, and you'll see here, if you
4 look at some of the bite marks, where you'll actually see
5 scabbing on top of the bite mark where the skin surface was
6 broken.

7 A class IV is a laceration. So not only was the skin
8 penetrated, but it was torn. Again, a grievous -- a grievous
9 insult, and extremely painful.

10 And the class V, it is an evulsion, which we also
11 have here. So not only was it a horrific bite, but a piece of
12 skin was torn off the body. In this case, it was the right
13 nipple.

14 So Teghan, who upon examination had approximately
15 sixty-six bites, those bites ranged in her case, according to
16 the Northwestern University Dental School bite classification
17 system, from class I's all the way through a class V.

18 Q The -- so you noted all of -- you noted -- what
19 classifications did you note on Teghan again? I'm sorry.

20 A I said that there were class -- all five
21 classifications of bites, from marks to an evulsion. And there
22 are many -- there are many instances on Teghan's body of
23 evulsive type injuries, where the skin has been removed. And I
24 just don't know if every one of those was a bite mark injury,
25 but certainly the right breast, the right breast, the nipple

1 was evulsively removed by mouth.

2 Q With regards to, you mentioned that there are very
3 few forensic dentists in North Carolina that are utilized; is
4 that right?

5 A I know that there are -- there is only one other
6 member in North Carolina who is a member of the American
7 Academy of Forensic Sciences. I don't know if there -- that
8 there are other dentists that are called, but at least at UNC
9 when they have a case of this nature, they -- they went to the
10 American Academy of Forensic Sciences directory and found my
11 name and one other.

12 Q And are there people who hold special certifications
13 from the -- from that particular foundation?

14 A Yeah, there are -- there is a competing organization
15 as well, called the American College of Forensic Examiners.
16 But the American Academy of Forensic Science is the oldest
17 scientific organization to deal with forensic evidence in the
18 courts, and they do have a boarding system, a special -- a
19 specializing type system.

20 You have to understand that forensic dentistry has
21 been studied in most -- in most undergraduate levels. And the
22 -- and there are some courses -- I had to take a forensic
23 dentistry course when I was an undergraduate. When I say,
24 "undergraduate," I mean undergraduate going through dental
25 training; had already had my bachelor's, of course. I went to

1 Loyola University in Chicago. But, so just to get my general
2 DDS degree, I did take some forensic dental school classes.
3 And UNC does offer forensic dentistry classes there. But for
4 the most part, there is no specialty offered by a university.
5 The specialization is offered through the Academy of Forensic
6 Sciences. It takes years to attain courses -- course work -- I
7 mean, class -- casework, I should say; casework and course
8 work. And then you sit before a peer review, and -- and you
9 can attain your fellowship. As you noticed in my C.V., I have
10 a fellowship through the Academy of General Dentistry. I do
11 not have a fellowship in the Academy -- the American Academy of
12 Forensic Sciences.

13 Q Does that make you any less qualified to --

14 A Not at all.

15 Q -- conduct the work that you do?

16 A Not at all. It just means that I have -- I have
17 decided not to sit for the board, and for numbers of reasons.
18 And let me add -- and let me tell you why. I've already told
19 you one, that a forensic dentist in North Carolina has to work
20 under the supervision of a forensic pathologist, a medical
21 examiner who has his board in forensic pathology. We don't
22 have that in the Cumberland County system. So I could go
23 through all this training, and still do the exact same thing I
24 do now, be called to the hospital on child abuse cases.

25 Additionally, this course work and this casework is

1 at a huge expense to somebody like me. Every time I go
2 somewhere or travel somewhere and take a course, I close my
3 office down, sit for a course that I have a high tuition for,
4 and leave. And when you are not utilized to the extent that
5 you feel you could be, it's -- you have to really realize,
6 then, why -- what is the significance of that board, if I -- if
7 I have the exact same -- the same experience, if not more than
8 some of my colleagues who are boarded, does it really matter?
9 And that's a personal opinion. So I've decided not to sit for
10 the board.

11 Am I -- would I be allowed to sit for the board? I
12 could. I've done enough cases that I could sit for the board
13 if I -- if I did probably some more administrative type things
14 that I have neglected to do.

15 THE COURT: Excuse me. Did you say it was oral
16 exams or written exams?

17 THE WITNESS: Both.

18 BY MR. JACKSON:

19 Q Are there other experts who work in your field who
20 have not sat for that particular --

21 A Oh, absolutely.

22 Q Okay, so that's not uncommon?

23 A No, sir.

24 Q You sent an email, I think, to my assistant. And in
25 the email, you had indicated --

1 This was early on. I think I think it was in
2 September of last year.

3 -- you indicated that you do not consider yourself a
4 bite mark expert. Can you explain that?

5 A I can. Two things. I tragically lost my daughter to
6 a sledding accident on December 27th the year -- the year prior
7 to that notification, so 2012. December 27, 2012, I lost my
8 only daughter. I had no desire to look at this case. And so
9 when I got that -- when I got the notification from the DA's
10 office to sit -- to work this case up, and to have to stare at
11 the pictures of Teghan's body, I just had no desire. And so I
12 was trying to bail, for one. I'll be just quite honest with
13 the Court, I just didn't want to do it.

14 The second thing was, I at one time was criticized by
15 an attorney on a child abuse case in Fayetteville because I
16 didn't have my boards. She was -- she was discussing a case
17 with me. As we were working up the case, she was asking me
18 some of the same questions you're asking me, and I said, you
19 know, "I don't have my boards from the American Academy of
20 Forensic Sciences." And she indicated at that time, or at
21 least implied that I was a sham. And so I wanted to make it
22 perfectly clear to this Court that I don't have my boards in
23 the American Academy of Forensic Sciences.

24 So in your opinion, you may not consider me to be a
25 dental expert. And in my opinion, I have done more casework

1 than most people in this State, and I feel that I can offer a
2 good scientific opinion in the interest of justice in this
3 case.

4 Q After examining and re-examining the dental evidence
5 found on the body of Teghan Skiba with the suspect's, did you
6 form any opinions with regards to that -- the identify of the
7 person who made those bite marks?

8 A The thing that makes this case extremely, extremely
9 unique is that the suspect pool is very small. I stated before
10 that I feel like no two individuals have the exact same teeth,
11 because of attrition and wear, trauma, et cetera. After
12 analyzing the victim's bite marks, multiple bite marks, and
13 after examining the suspect's teeth, I truly believe that
14 there's a high scientific consistency to the victim's bite
15 marks and the suspect's dentition.

16 Q In your written report, you indicated that you
17 believe with a high level of confidence that Jonathan Douglas
18 Richardson made the bite marks; is that true?

19 A I stand by that statement.

20 Q Okay. And can you explain to the Court why you stand
21 by that statement?

22 A I think I already have. I think I -- I have made
23 that statement over again today, because I looked at unique
24 characteristics found on the dental bite marks on Teghan
25 Skiba's body, I looked at all the unique characteristics of

1 Jonathan Richardson's mouth, and I think that there were enough
2 unique and individual characteristics in Jonathan's mouth,
3 specifically in his teeth, even more specifically in the front
4 maxillary six teeth and the lower mandibular six teeth, to
5 think that the bite marks inflicted were made by his teeth.

6 Q And are the -- I forgot to ask you this. In your
7 opinion, where the bite marks that you saw consistent with
8 being made by a child or an adult?

9 A A child in this case could not have made these bite
10 marks, for the reasons we've discussed earlier, about the class
11 characteristics. Children's central incisors are much smaller.
12 Like, an adult's central incisor is between eight and ten
13 millimeters wide; whereas, a child's central incisors are
14 roughly five and a half to six millimeters wide. There are
15 spaces in between children's teeth, called primate spaces. We
16 see quite a few spaces between kids' -- it's a system so that
17 when the permanent dentition comes in, there's not so much
18 crowding, because the permanent teeth are so much larger.

19 And so in this particular case, I cannot see -- I
20 don't see any relationship between the bite marks made on
21 Teghan's Skiba's body, and those made by any child.

22 MR. JACKSON: Your Honor, at this time I would move
23 to introduce into evidence State's Exhibit VD -- I'm sorry.
24 May I approach the witness?

25 THE COURT: Yes.

1 BY MR. JACKSON:

2 Q I'm going to show you, Doctor, what has been marked
3 for identification purposes State's Exhibit VD-9, for voir
4 dire. Do you recognize what that is?

5 A I do. This is a report I wrote on October 29th,
6 2013. And it says, "The analysis of dental evidence involving
7 the decedent Teghan Skiba."

8 Q Does that summarize your opinions and conclusions
9 that you've rendered here today?

10 A It does.

11 MR. JACKSON: State moves to introduce into evidence
12 State's Exhibit VD 9.

13 THE COURT: That's a report dated October 29?

14 MR. JACKSON: Yes.

15 THE COURT: Received.

16 MR. JACKSON: Those would be my questions.

17 THE COURT: Who's going to conduct Cross?

18 MR. BROUN: I am.

19 THE COURT: How long do you expect it's going to
20 take?

21 MR. BROUN: It will depend somewhat on how long
22 his answers are. I have several questions that are designed to
23 be yes/no answers, but I realize that's not always possible.
24 And I would guess -- this is a rough guess -- forty-five
25 minutes.

1 THE COURT: And both of you are going to want to
2 be heard. Let's discuss the plan. You folks have predicted
3 that the voir dire of this witness would take about an hour.
4 It's obviously taking much longer than that. You also
5 represented that you expected the voir dire of Dr. Cooper would
6 be significantly longer than this witness. Dr. Cooper is here.
7 I certainly don't mind getting started this afternoon, but we
8 will not finish. If I recall correctly, you stated there was
9 some problem with the availability of one of your witnesses.
10 One was going out of country for a brief period of time, or
11 something, and you --

12 MR. JACKSON: Here's our situation, your Honor. And
13 I do appreciate and I apologize to Dr. Cooper, but I didn't
14 anticipate it was going to take this long, and I'm bad about
15 predicting, and I apologize to the Court. But Dr. Cooper is
16 going to Guam Monday.

17 THE COURT: Monday.

18 MR. JACKSON: She's not going to be back until
19 Saturday.

20 THE COURT: That's fine.

21 MR. JACKSON: And so what I would intend that we do
22 is to finish up with Dr. Barbaro, and then if we can get Dr.
23 Cooper -- start Dr. Cooper's testimony, we could do that, but
24 it's becoming clear to me that if we start the evidence next
25 week, that we may just not be at the point where I would be

1 allowed to mention, you know, her testimony in opening
2 statements, and that's just the function of where we are now
3 and our schedule.

4 THE COURT: All right, as long as we're on the
5 same sheet of music, that's fine.

6 MR. JACKSON: I don't -- I don't see any --

7 THE COURT: I'm not going to delay the
8 presentation of evidence until we have --

9 MR. JACKSON: I understand. Well, I would ask that
10 you do that, but I don't expect you to do it.

11 THE COURT: She'll be back, though -- she'll just
12 be gone one week; is that correct? So we can work her voir
13 dire in during the trial at some point?

14 MR. JACKSON: Yes. May she speak? May the doctor -
15 -

16 THE COURT: You certainly may. Yes, ma'am, Dr.
17 Cooper. You may step up, if you would like.

18 (Dr. Cooper stands up and speaks from the front of
19 the aisle.)

20 DR. COOPER: Yes, sir, I will be out of the country
21 for next week for two federal cases, and then the week after
22 that, I will be in three different cities. The only day I'll
23 actually be in this city is February 24th, and I have a
24 scheduled deposition on that particular day. For that week.
25 But right after that, I will be back, would be the first week

1 of March.

2 THE COURT: So it appears, then, Dr. Cooper, you
3 would not be able to be available either of the next two weeks;
4 is that right?

5 DR. COOPER: That would be accurate, sir.

6 THE COURT: But anytime after March 3?

7 DR. COOPER: Anytime, yes --

8 THE COURT: We could work you in --

9 DR. COOPER: Yes, sir.

10 THE COURT: -- depending upon your schedule?

11 DR. COOPER: Yes, sir.

12 MR. JACKSON: She has other dates, though. I think
13 we could find time to work her in.

14 THE COURT: All right. That's what I wanted to
15 know. All right, thank you very much.

16 Do you want to try to get started with her testimony
17 today?

18 MR. JACKSON: May I have a moment?

19 THE COURT: You sure may. I mean, understanding
20 that we are likely not going to finish.

21 (Mr. Jackson and Dr. Cooper confer.)

22 MR. JACKSON: Your Honor, because we certainly
23 would not be able to finish her now, and the purpose of putting
24 her on now was so that we would have the ruling before we
25 started the evidence, I don't see any need to keep her here,

1 and that we will just schedule her testimony sometime within
2 the next two weeks, or whenever it's convenient for her and the
3 Court and the presentation of evidence. It means -- I
4 understand that -- that that -- the motion -- the order in
5 limine is still in effect, and I understand that.

6 THE COURT: Is Defense okay with that?

7 MR. BROUN: Yes, I think it would make -- doesn't
8 make sense just to start her testimony and then two weeks later
9 finish it. It makes sense to, right before she testifies or
10 sometime --

11 THE COURT: And I would expect we need to allocate
12 a full half day for the voir dire of Dr. Cooper. Do you folks
13 agree with that prediction, or estimate?

14 MR. BROUN: Yes, sir.

15 MR. JACKSON: Yes, sir, at least. At least. And a
16 lot of it depends on whether or not -- I mean, the Defendant's
17 motion is based upon -- is broad, in that all of her testimony
18 is prejudicial. And I didn't know if we would be able to
19 streamline some of the issues involved in the case, whether
20 we're talking about torture, or we're just saying that
21 everything she says is prejudicial. So that was -- I didn't --
22 I wasn't sure exactly what they were objecting to in her
23 testimony. It sounds like absolutely everything, so that would
24 indicate to me that it would probably take longer.

25 THE COURT: Well, you can talk to the Defense

1 about that and let me know.

2 MR. JACKSON: Yes, sir, I will.

3 MR. BROUN: And I do think our motion did outline
4 some particular concerns in it, as well. But I would be glad
5 to talk to Mr. Jackson about it.

6 THE COURT: And I think everyone recognizes that
7 Dr. Cooper has testified as an expert in forensic pediatrics or
8 some similar field --

9 MR. BROUN: Yes.

10 THE COURT: -- any number of times in the Superior
11 Courts of this State, so it was not clear to me whether you
12 were objecting to her testimony in whole or merely to a number
13 of the opinions that she expressed in her report. But you
14 folks let me know, and that may make a difference in the amount
15 of time we need to set aside for her voir dire.

16 All right, so you're going to just release her for
17 today, then; is that right?

18 MR. JACKSON: Yes, sir, with my apologies.

19 THE COURT: All right, have a good trip to Guam.
20 We'll see you in a couple of weeks.

21 DR. COOPER: Thank you, sir.

22 THE COURT: Yes, ma'am. Thank you, Doctor.

23 (Dr. Cooper exits the courtroom at 2:42 p.m.)

24 All right, Cross?

25 CROSS-EXAMINATION BY MR. BROUN: 2:42 p.m.

1 Q Good afternoon, Dr. Barbaro.

2 A Good afternoon, sir.

3 Q And I apologize if I mispronounced your name.

4 A It's Barbaro, but that's fine. You're perfect.

5 Q All right, I may refer to you as, "Doctor," then.

6 A Okay.

7 Q It's my understanding, sir, that you have been
8 involved in forensic dentistry since 1984?

9 A That's correct, sir.

10 Q And I think I understand from -- that your primarily
11 responsibility in this was to recognize dental forensic
12 evidence, record it, and to make recommendations?

13 A Yes, sir.

14 Q And I want to talk with you -- we talked a little bit
15 about an email that you sent to the District Attorney's office.

16 MR. BROUN: If I may approach, your Honor?

17 THE COURT: Yes, sir.

18 BY MR. BROUN:

19 Q Sir, I'm showing you what's been marked as Voir Dire
20 -- Defendant's Voir Dire Exhibit Number 1 for identification
21 purposes. Do you recognize this? I do -- I do recognize that
22 the first part of it is an email, but the second part of it
23 seems to be an email that you sent?

24 A Yes, sir, I recognize this.

25 Q And is that the email that you sent to Tammy Johnson?

1 A It is. It is.

2 Q Okay.

3 MR. BROUN: Your Honor, I would move to introduce,
4 for this hearing purposes, VD Exhibit Number 1?

5 THE COURT: Any objections?

6 MR. JACKSON: No.

7 THE COURT: All right, received.

8 BY MR. BROUN:

9 Q Sir, could you read this email?

10 A I can. "There is some information that I feel is
11 pertinent to this case. I have been involved in forensic
12 dentistry since 1984. I have studied and trained under some of
13 the pioneers in this field. My primary purpose is to recognize
14 dental forensic evidence, record it, and to make
15 recommendations. I have been tendered an expert in North
16 Carolina Superior Court and in Federal Court, involving cases
17 of personal injury and child abuse. I do not have my boards
18 with the American Society of Forensic Sciences. I am board
19 certified in the State of North Carolina to practice general
20 dentistry, and I am a fellow in the Academy of General
21 Dentistry. I have worked with North Carolina SBI involving a
22 murder case and was flown to Florida, where I presented my
23 evidence to a bite mark expert, and yet subsequently rendered
24 an opinion regarding the suspect pool. I have testified in
25 court involving a child homicide, testified as per the presence

1 of a bite mark and describing the mechanics of such a wound.
2 In this case the suspect had already admitted to play-biting
3 the decedent. I do not consider myself to be a bite mark
4 expert. There were only two dentists in the State of North
5 Carolina at time of this particular crime who are members of
6 the American --" and there's a typo here, but it's the American
7 Academy of Forensic Sciences." This says, "ASFS," American
8 Society of Forensic Sciences, but for the record, it's American
9 Academy of Forensic Sciences. It's a typo. "I happen to be
10 the one contacted by the Childrens' Hospital at UNC-Chapel Hill
11 to examine the child and to report my findings to the forensic
12 pediatrician. I am more than happy to help in any way, but the
13 District Attorney needs to read this letter so he is not blind-
14 sided by the defense. Sincerely, Richard Barbaro."

15 Q And, sir, and I understand from your recitation some
16 of the reasons why you said that you wrote the email. But the
17 factual statements in that email are correct?

18 A The factual statements are correct.

19 Q Okay. And it is true that you do not have your
20 boards with the American Society of Forensic Sciences?

21 A That's correct.

22 Q And you did write in an email that you did not
23 consider yourself to be a bite mark expert?

24 A Correct.

25 Q And in the past, you have testified in cases

1 regarding the presence of bite marks?

2 A I have.

3 Q In child abuse cases?

4 A Correct.

5 Q And you described the mechanics of the wounds?

6 A I did.

7 Q Okay. Including in a child homicide case?

8 A Correct.

9 Q But I believe with the exception of one case, which I
10 will get to in a moment, you did not testify as to whether the
11 bite mark matched the defendant?

12 A I was never asked that question by the prosecution or
13 the defense.

14 Q Okay. So you have not been asked that. And didn't
15 ask -- or testify whether it matched or whether it excluded the
16 defendant either?

17 A The specific question asked by the defense was how
18 did I know that, in this -- in this particular case, Arnold
19 Hicks made the bite mark. And it was because the defendant had
20 admitted to biting the child.

21 Q Okay, so you testified -- you only testified in --
22 you testified in Arnold Hicks's case? That was a case you
23 testified in, in 1996, I believe?

24 A It was Arnold Hicks. The decedent was Mus -- Colton
25 Muskrat.

1 Q Okay.

2 THE COURT: Excuse me. Are you saying Arnold
3 Hicks, H-I-C-K-S?

4 MR. BROUN: H-I-C-K-S; H-I-C-K-S, I believe that's
5 right.

6 BY MR. BROUN:

7 Q Is that correct, sir?

8 A That is correct.

9 Q And in that case, that was -- that was the case where
10 you testified in 1996?

11 A In -- in -- in Judge Johnson's court, Superior Court.

12 Q And you testified that you knew he made the bite
13 marks because he admitted to making the bite marks?

14 A Yes. And I had done a forensic evaluation, as I have
15 done here, and -- and there were concordant features in both
16 the bite mark and the victim's -- and in the suspect's
17 dentition.

18 Q But you made your basis that the opinion based on --
19 you didn't testify at that point, as you are doing here, about
20 the comparisons of the teeth and the impressions; you testified
21 you knew he made the bite marks because he said he made the
22 bite marks?

23 A That's what I was asked, and that's how I -- that's
24 how I defended my position.

25 Q Okay.

1 A Had I been asked -- had I been asked whether or not
2 he -- had I been asked by the Court at that -- on that
3 particular day, to present the evidence that I'm presenting to
4 you at this point, I would have. I did not.

5 Q But you weren't asked that?

6 A I was not asked that.

7 Q And you --

8 A Which does not mean -- does not exclude me as being
9 able to; I was just not asked that.

10 Q Sure. My question is, at that point, when you
11 testified, you were basing it -- your testimony as you were
12 giving it at that point was based on what he said?

13 A Not -- not necessarily.

14 Q Okay.

15 A I was asked the question by the defense, how did I
16 know.

17 Q Okay.

18 A I knew because he told me.

19 Q Okay.

20 A I didn't have to -- I didn't have to extrapolate --

21 Q You didn't have to --

22 A Exactly. I didn't have to extrapolate. I could
23 have. I didn't have to.

24 Q But you didn't do that?

25 A Well, it's the same as in this -- in this

1 questioning. You know, I'll ask -- I'll answer the question
2 addressed. If you want me to extrapolate, I will. In this
3 particular case, the defense asked me, and I -- it was easy.

4 Q Okay. So you based that opinion based on what he
5 told you?

6 A Exactly.

7 Q Okay, thank you. And you talked about, I think you
8 worked on a case you said at Heather Ridge Apartments?

9 A I did.

10 Q Okay. Do you remember the name of the defendant in
11 that case?

12 A It was Philip Wilkinson.

13 Q Okay.

14 THE COURT: I'm sorry, Philip what?

15 THE WITNESS: Wilkinson.

16 THE COURT: Wilkinson.

17 BY MR. BROUN:

18 Q But what you did in that case is you presented the
19 evidence of what you found to the dentist in Florida?

20 A What I did was exactly the same thing that I've done
21 here. I was -- that was my first homicide case. The -- the
22 Fayetteville Police Depart -- and you have to start somewhere.

23 Q Sure.

24 A Will you grant that? You have to start somewhere.
25 So, the Fayetteville Police Department, with the State Bureau

1 of Investigation, flew me down to Dick Souviron's office in
2 Miami. And we had a suspect pool of four, and we worked up the
3 case. It was Chrystal Hudson was the decedent with four bite
4 marks.

5 Q Okay, so you went and -- the one who actually
6 testified in that case was the dentist from Florida; correct?

7 A Did he? I don't -- I did not go to court on this.

8 Q Oh, you did not go to court?

9 A I was not subpoenaed for that -- for that trial.

10 Q Okay, so you did not testify in that particular case?

11 A As I recall, I don't know if you know the answer to
12 this, as I recall, he -- he pled. It was -- as a matter -- it
13 was a capital punishment.

14 Q Yes.

15 A And he pled on appeal, he -- he -- he appealed the
16 case afterwards, or appealed the capital crime, and he still --
17 he's still on death row.

18 Q Yes. Just clarifying --

19 A Yes, sir.

20 Q -- in this case you did not testify about bite marks?

21 A Right, I had --

22 Q (Interrupting.) So you have -- so the scientific
23 methodology that you talked about in this case, you have never
24 testified about, matching bite marks based on teeth impressions
25 and matching it to skin in any court in North Carolina; is that

1 correct?

2 A That is correct.

3 Q And any court anywhere in this country; is that
4 correct?

5 A That is correct.

6 Q Okay.

7 A Let it -- let it be stated, though, that was in 1996;
8 is that correct?

9 Q The trial?

10 A 1996 to --

11 Q It may have been -- the trial may have been 1994.

12 A I have not -- I have not been subpoenaed. I have
13 worked on many cases since 1996. They -- the prosecution or
14 the defense elected not to subpoena me for -- for testimony.
15 It doesn't mean that I wasn't ready for it.

16 Q Sure.

17 A I have caseloads in my office of this type of
18 evaluation.

19 Q Sure. Okay. I'm just trying to clarify how --

20 A (Interrupting.) Yeah, I understand.

21 Q -- many times --

22 A I just want to make sure you know --

23 COURT REPORTER: One at a time.

24 MR. BROUN: Okay. Sorry.

25 MR. BROUN:

1 Q Let's talk about, you're familiar with the concept
2 of proficiency tests. When was the last time you took a
3 proficiency test to determine how accurate your conclusions are
4 when it comes to bite mark identification?

5 A I've never taken a proficiency test.

6 Q You've never taken a proficiency test?

7 A No, sir.

8 Q Okay. Do you know, from any test or examination,
9 what your error rate is?

10 A I know from the -- from the literature, the error
11 rate can be as high as sixty-three percent.

12 Q How high?

13 A Sixty-three.

14 Q It can be as high as sixty-three percent?

15 A Yes, sir.

16 Q Okay. You don't know --

17 THE COURT: I'm sorry, the error rate in what?

18 BY MR. BROUN:

19 Q Your error rate; how often --

20 A Error rate. Not my error rate --

21 Q Right.

22 A -- the error rate in bite mark analysis is reported
23 in some of the literature to be as high as sixty-three percent.

24 Q It's been as high as sixty-three percent?

25 A Yes, sir.

1 THE COURT: What sort of analysis?

2 THE WITNESS: Analysis? The analysis of analyzing
3 the victim's bite mark to the suspect's dentition.

4 BY MR. BROUN:

5 Q Okay, right. So the error rate has been as high in
6 the literature as sixty-three percent wrong, but you don't know
7 anything that shows what your particular error rate might be?

8 A I have -- I don't have an error rate.

9 Q Okay. Because it's never been tested?

10 A It's never been tested.

11 Q Okay, thank you. When you -- in the report that you
12 did, you concluded that the correlation between Jonathan
13 Richardson's teeth to the bite marks found on the decedent's
14 body is extremely good; is that what you said, in the report?

15 A I -- whatever you have written before you. I would
16 agree to that -- to that statement.

17 Q Okay. And then you said, "I believe with a high
18 level of confidence that Jonathan Richardson made these bite
19 marks."

20 A I do.

21 Q All right. Could you break down statistically, what
22 is the probability of that?

23 A A hundred percent that he did.

24 Q A hundred percent? Okay, what are you basing that
25 statistical model on?

1 A Suspect pool

2 Q The suspect pool.

3 A No one else had access to Teghan Skiba during the
4 time frame of these injuries.

5 Q Okay, so you're basing it on the fact that it was
6 only Jonathan Richardson who had access to Teghan Skiba? And
7 so --

8 A That's -- that's not what I'm only basing it on.

9 Q Okay.

10 A You asked me what I thought -- what I thought the
11 percentage of his making it; I said a hundred percent. I'm
12 basing the hundred percent on the fact that the suspect pool is
13 limited to one. You know, give me the suspect -- give me a
14 different suspect pool and let me analyze their teeth, and we
15 can look and see if there are any other concordant features
16 within that suspect pool and Teghan Skiba's bite marks. In
17 this particular case, and I think it's the thing that makes
18 this case so unique, is the suspect pool is one.

19 Q So you're basing your conclusions at least --

20 A No, I'm not --

21 Q -- in part --

22 A No, I'm not. I'm not basing my conclusions. I'm
23 basing my conclusions on the evidence.

24 Q Okay.

25 A The evidence presented and the analysis that I've

1 made, of the many, many hours I've -- I've -- I've spent here
2 looking at measurements, angles, radiuses, and those kinds of
3 things. That's what I'm basing my opinion on.

4 But you asked me what I thought my statistical value
5 was. And the statistical value is a hundred percent in this
6 case.

7 Q And -- but that's based on not just what you saw on
8 the teeth, but the other evidence surrounding the case;
9 correct?

10 A No. Well -- well, as a defense attorney, would you
11 like to give me a different suspect pool, and then I could work
12 those cases up. Then -- then -- in this particular case, the
13 courts have given me one suspect to work-up, and that's what I
14 did.

15 Q Okay. And because there's only one suspect, that
16 influences what your -- what the statistical models that you
17 found in this case?

18 A The statistical model. It has nothing to do with the
19 analysis that I made between a bite mark and between suspect's
20 dentition.

21 Q Well, let me give you this analogy and see if you can
22 compare with it. For instance, when they're doing DNA tests --

23 A I'm not a DNA --

24 Q -- the SBI --

25 A I am not a DNA expert, sir.

1 Q I understand. Let me just give you this analogy, and
2 then I can ask questions.

3 A Okay.

4 Q The SBI will give a probability. They might say
5 something like this. I'm going to just give an example. "The
6 probability of an unrelated individual with a DNA profile that
7 matches the predominant DNA profile obtained here --"

8 MR. JACKSON: Objection.

9 BY MR. BROUN:

10 Q "-- is greater --"

11 THE COURT: Overruled.

12 BY MR. BROUN:

13 Q "-- than one in a trillion of the NC Caucasian,
14 Black, Lumbee Indian, and Hispanic population." They give a
15 specific probability of it, based on the DNA science.

16 And so my question is -- they form -- do you -- does
17 it make sense to you that they formed --

18 A It does.

19 Q -- a pool to compare it with?

20 A It does.

21 Q And they compare with. Is there cite to the
22 statistical model that you used in this case?

23 A I did not. Let me -- let me back up my argument this
24 way. One, never in the courts in North Carolina or in the
25 courts in America has dental evidence, bite mark evidence, ever

1 been excluded in testimony. I have that. That's a fact. So
2 the same questions that you're asking me have been asked to
3 every forensic dentist in the courts of law in the United
4 States. Never has this testimony been excluded, ever.

5
6 Number two, I will tell you that bite mark evidence
7 will not hold to the same test that DNA evidence will.

8 Q Okay.

9 A I agree with you a hundred percent, a hundred
10 percent. And I will also agree with you that any case that was
11 based solely, solely and totally on bite mark evidence should
12 be overturned. And I think most of those cases have been
13 looked at different courts.

14 This case has not been decided on, or this case is
15 not being looked at based on dental evidence. This case is
16 being looked on by a myriad of things, to include dental
17 evidence. I am a part of that puzzle; that's all.

18 Q Okay. So --

19 A And I don't think I or anybody in your research, and
20 I'm sure you've done it, as I have as well, I don't think in
21 your research or in mine can anybody attest to a percentage of
22 probability that suspect A made bite mark B. I agree with you
23 there.

24 Q Okay, you agree with that, all right.

25 A Okay, this isn't DNA.

1 Q This is not DNA.

2 A This is not DNA.

3 Q It doesn't have percentages --

4 A This is tool -- tool mark evidence, as you would find
5 in other tool mark evidence in the forensic science aspect.

6 Q Okay. So we agree, no probability, no percentages.

7 A Totally; no statisticians here.

8 Q Okay. Did you compare the bite mark evidence in this
9 to any models of Helen Reyes?

10 A I did not. She wasn't there. But I did not.

11 Q All right.

12 A Good question. She was not there, so I -- she wasn't
13 -- she wasn't part of the investigation.

14 Q And you didn't compare it against any other teeth
15 mark impressions in the entire world?

16 A I did not. I'm willing to, but I did not.

17 Q Okay. And at the time, you said that you -- before
18 you did these impressions, you Googled the case?

19 A Before -- when I -- what I said was, on any
20 investigation, I always Goog -- I can know nothing about this
21 case, and so I Googled the case and found out that Jonathan
22 Richardson was a suspect in a murder case involving the
23 decedent -- you know, obviously, I already knew that he was a
24 suspect and that Teghan was the decedent, because I was there.
25 I wasn't there for him, but I was there for her. And, of

1 course, I looked at the hospital records and I saw, you know,
2 what had happened. I saw why Teghan was at UNC, at the PICU
3 unit, et cetera, et cetera. And then, as you would do, I tried
4 to get as much information about the case as I could. That's
5 all.

6 Q So -- and so you knew, as you just said, that he was
7 the chief suspect in the case?

8 A I did.

9 Q You knew how bad the injuries were to Teghan?

10 A I saw them.

11 Q You saw them, so you definitely knew.

12 A I definitely knew.

13 Q And you knew that the police believed that Jonathan
14 Richardson caused the injuries?

15 A I -- I -- you know, I have, in the twenty-five years,
16 or whatever --

17 You do the math.

18 -- in the twenty-plus years of doing this, I never --
19 because my reputation is at stake, not just as an expert here,
20 quote/unquote, "expert" in this courtroom, but as you have an
21 unbelievable reputation in the courts, doing what you do, I
22 have a good reputation. And my reputation is more important to
23 me than anything. And so when I work up a case, I am a
24 scientist, as I said before, and I don't -- my job is to
25 exclude any suspect, to include Jonathan. My job is to exclude

1 him as the prospective biter, not to include him.

2 And that -- and that's the way I look at any dental
3 evidence that I use. Can you include or exclude the suspect in
4 this case? In this particular case, there is no question that
5 if you gave me five suspects, that Jonathan Richardson would be
6 included in the suspect pool. He cannot be excluded from this
7 evidence, because of the way it shows.

8 Q My question is this. You knew that the police
9 believed that Jonathan Richardson was the one who caused the
10 injuries; correct?

11 A He was -- he was brought to me by Detective Snipes as
12 the primary suspect in this case.

13 Q Okay, thank you. You also, in the report that you
14 submitted to the Court, you said that Teghan was whipped
15 repeatedly?

16 A Oh, obviously.

17 Q Yeah. But you're not an expert in whip marks?

18 A I've been around this -- I'm not an expert at whip
19 marks, but I've been around them --

20 Q That's my question, you're not an expert?

21 A Oh, no, I'm not. I'm not.

22 Q Okay.

23 A Sir, if you saw a burn mark on the skin and you
24 didn't see me burn you, would you know that was a burn mark?
25 Are you an expert at burn marks?

1 Q Well, the question -- the question, sir, simply is --

2 A No, I'm not --

3 Q -- trying to define if you have expertise.

4 A I didn't -- I didn't -- I didn't refer in my report
5 that I was an expert in the field, I just noticed that there
6 were whip marks on the body.

7 Q And you're not an expert in burn marks either?

8 A Not at all, but I saw some.

9 Q But you put in your report that there were burn marks
10 there?

11 A I've been studying this for twenty-plus years. I see
12 photographs of burn marks. I know what a burn mark looks like.
13 I know what a whip mark looks like. I know what a laceration
14 looks like. I'm not an expert on lacerations either. I know
15 what -- what an absent fingernail looks like. I'm not an
16 expert on fingernails either. I'm not -- and I'm not an expert
17 --

18 Q (Interrupting.) Sir, sir, I'm just trying to
19 establish what your expertise is. And you're not an expertise
20 in burn marks, are you?

21 A I am not an expert in burn marks.

22 Q All right, thank you, sir. You talked about the 1977
23 study showing that eleven of forty-eight autopsy child abuse
24 victims showed human bite marks; correct?

25 A By Decker, I believe.

1 Q What's the cite -- do you know the cite of that
2 study?

3 A I don't.

4 Q Okay. Do you know any more recent studies on that
5 issue?

6 A I don't.

7 Q Any ones that used more than just forty-eight --

8 A No. What -- what I was trying to show, in some of
9 the literature, for both of your -- for both of your
10 edification, was that in a lot -- in a number of -- a
11 statistically significant number of child abuse cases, we do
12 see bite marks, as do we see in homicides of other natures, and
13 rape cases, and sexual assaults.

14 Q Sir, you talked about, and back to your examination,
15 how you make some efforts to keep up with the literature
16 involving this area. Are you familiar with the study done by
17 the National Academy of Science, and the reports?

18 A I was just shown that specific study today.

19 Q Okay.

20 A But I -- I -- I have quite a bit of literature
21 review. I've done quite a bit of literature review on this
22 case, in anticipation of this case and your questions.

23 Q Okay, so --

24 A But I am semi-familiar with the article that you just
25 held up.

1 Q You are semi-familiar with it?

2 A Yes.

3 Q Okay.

4 MR. BROUN: If I may approach?

5 THE COURT: Yes.

6 BY MR. BROUN:

7 Q Doctor, I'm showing you what's been marked as Voir
8 Dire -- Defendant's Voir Dire Exhibit Number 2.

9 A Yes, sir.

10 Q And it is an excerpt -- well, do you recognize this
11 as being an excerpt of the, "Strengthening Forensic Science in
12 the United States" report?

13 A I see that as such, yes, sir.

14 Q And you said that you had some familiarity with this
15 report?

16 A That is correct.

17 Q Okay. How do you have familiarity with this report?

18 A It was shown to me by counsel right before I -- right
19 before this Cross, sir.

20 Q Were you familiar with this report before you came to
21 testify today?

22 A I don't know about this specific report, but I am
23 very familiar with questions and appeals on bite mark evidence,
24 and about the American Board of Forensic Odontology and their
25 studies. I have not read this report, so I'm not going to

1 answer specific questions about that. So why don't you be
2 specific in your questioning, because I -- I don't -- was just
3 shown the report, so --

4 Q Sure. I'll be glad to do that. But you are aware,
5 it sounds like from your talking about it, that there has been
6 criticisms of the field of bite mark analysis?

7 A Without question.

8 Q Okay, and about how accurate the science is?

9 A I cited a study of sixty-three percent.

10 Q Sixty-three percent. That's right, you cited a study
11 that there's sixty-three percent false positives?

12 A Right. I'm very aware of the ambiguity here.

13 Q Okay. And were you aware that -- that one of the
14 concerns is, is that bite marks in the skin can change over
15 time?

16 A Absolutely.

17 Q And you're aware -- and I believe that you saw the
18 injuries on Teghan on Saturday?

19 A The 7th -- is that the -- I forget. The Saturday at
20 10:30 at night, whatever date that was. It doesn't matter. I
21 believe it was on Saturday.

22 Q I believe it was July 17th --

23 A Yes, sir.

24 Q -- that they --

25 A Yes, sir.

1 Q And you're aware that the doctor's conclusions that
2 the injuries were, bite mark injuries appeared to be at least a
3 few days old when she had been brought in?

4 A I agree.

5 Q Okay. And you also agree that -- with some of the
6 literature that says that bite marks can be distorted by the
7 elasticity of the skin?

8 A No question.

9 Q Okay. By -- by even surface bites?

10 A Yes, sir.

11 Q By swelling and healing?

12 A Absolutely.

13 Q And that there was criticisms of bite mark
14 comparisons because there was no science on the reproductive --
15 reproducibility of the different methods of analysis could lead
16 to conclusions about the probability of a match?

17 A Yes, sir. I think if you've seen the study done by
18 Sweden, you will see that they did a study of identical twins,
19 and they were trying to get some scientific statistical value,
20 and they were unable. So, yeah, I'm very well-versed in the
21 literature.

22 Q Okay, so you talked about the study from Sweden, and
23 they were unable to gather something to show an exact match,
24 okay. And where they've been able -- there haven't been any
25 studies that talked about the ability to reproduce the efforts

1 among different experts?

2 A You're correct.

3 Q Okay. And you would also know that there's criticism
4 of the science because there's been no thorough study conducted
5 of a large populations to establish the uniqueness of bite
6 marks?

7 A You're -- you're citing -- you're citing studies that
8 I've read as well. You're taking things out of context. Out
9 of context, I agree.

10 Q That there's been no --

11 A Yeah, absolutely, yeah.

12 Q And you talked about that in your own experience, as
13 a dentist thirty years, you think that there's uniqueness, but
14 there's no studies that indicate that --

15 A That's no studies. And I'm what I'm saying, and
16 maybe this is what you're trying to get me to admit, so let's
17 cut to the chase, I don't believe there's one person in this
18 room or in this city that has the exact same teeth, okay? The
19 trouble with -- the trouble with the studies and the trouble
20 with your interpretation of this literature is that we've
21 already admitted that the bite marks are made on elastic
22 materials and non-static -- and non-static materials. That's a
23 given. And they are -- they are made in a dynamic fashion.
24 It's a given. I can't disagree with you on either of those
25 counts. The problem -- and I'm going to refer back to, at

1 least a study that I have, no Court in the United States has
2 ever disallowed forensic dental evidence. So even though you
3 have all these studies, no judge has ever disallowed the, at
4 least the testimony of a forensic dentist, whether he's board
5 certified or not. That's --

6 Q But you understand that that's -- that's not the
7 issue.

8 A Well, but -- but I'm just saying, you know, if in
9 fact that's the case, that all of these studies have been
10 conducted yet no judge has denied the testimony, that says
11 something about the court system, number one. Number two, the
12 cases that support your argument are cases that were -- and
13 let's -- we'll talk about Krone from Texas. Did you do that
14 study? Did you look at that study by Ray Krone? He was --
15 Arizona; Arizona. I think it was -- I forget; 1996? I'm not
16 sure. But Ray Krone was falsely identified, and -- and given
17 life in prison; was re-examined by a different set of dentists
18 and was given life in prison again; and then it was the DNA
19 evidence that exonerated him. So -- but -- but how did that
20 case go to trial? That case went to trial because he was -- he
21 was -- he was indicted on dental evidence only. There was no
22 other corroborating evidence that would have included him in
23 that crime. But for whatever reason, they allowed that case in
24 the courts, and solely on dental evidence. This particular
25 case is not based solely on dental evidence. And I think your

1 argument is well-founded, if in fact that's all it was. But
2 that is not what we're here for.

3 Q So Ray Krone, that you're talking about, this case is
4 one of multiple cases, I'm sure you're aware of, where people
5 have been convicted based on dental evidence and then later
6 shown to be innocent--

7 A Right.

8 Q -- based on DNA?

9 A That is true. But -- but you're -- you're missing
10 the one solid point there. They haven't been based on dental
11 evidence; they've been found guilty solely based on dental
12 evidence.

13 Q Solely based on dental evidence?

14 A Solely, yeah. That's a significant question, or word
15 that you're leaving out. The word, "Solely" makes this -- that
16 unique, and this -- this unique in the fact that it wasn't
17 solely based on dental evidence. You don't have me up here as
18 a dental expert because the only evidence on this body was
19 dental. You would agree with that?

20 Q I'm letting you answer the questions, sir.

21 A Okay.

22 MR. BROUN: I need one second, your Honor.

23 (Mr. Broun and Mr. Klinkosum confer.)

24 BY MR. BROUN:

25 Q And you would agree with there is no central

1 depository of bite marks and patterns anywhere?

2 A There is no central depository, that's correct.

3 Q So, of course, that means you didn't compare to any
4 central depository; is that correct?

5 A I did not, sir.

6 Q And you would agree with this statement, too, "If a
7 bite mark is compared to a dental cast using the guidelines of
8 the ABFO, and the suspect providing the dental cast cannot be
9 eliminated as the person who made the bite, there is no
10 established science indicating what percentage of the
11 population or subgroup of the population could have produced
12 the bite?"

13 A I truly agree with that.

14 Q Thank you. There's also in this case that there was
15 no other expert who checked your work?

16 A I figured you would do that.

17 Q All right. There was no blind comparison done in
18 this case?

19 A No blind comparison. I'm the sole dentist in this
20 case.

21 Q And --

22 A But you've had -- you've had this information for a
23 long period of time.

24 Q Okay.

25 A So, I mean, you -- no one prevented you from pulling

1 an expert in, nor -- I think my work --

2 THE COURT: Objection is sustained.

3 MR. BROUN: I'm sorry; objection.

4 BY MR. BROUN:

5 Q The -- and we talked about lack of uniqueness of
6 human teeth, that it has not been found the human dentition,
7 the marks they made, are unique; is that correct? There's no
8 scientific study that found that --

9 A There are no -- no.

10 Q Okay. And even if it were unique, and even if we
11 assume that the teeth are unique, indentions could be unique,
12 nothing of that could be transferred to the skin in a unique
13 way; is that correct?

14 A I -- I wouldn't agree to that.

15 Q There is no study that's been shown that --

16 A There's plenty of studies that show that teethmarks
17 leave unique -- unique impressions in the skin. There is -- I
18 mean --

19 Q Unique they can identify to a particular individual?

20 A In a suspect pool; you can --

21 Q In a suspect pool?

22 A Yeah, you know, are you saying -- again, I mean, I
23 have to just rely on the court system, that there have been
24 many cases allowed in the court. Let's look at State versus
25 Temple, or State versus Green. The Courts -- the Courts

1 allowed dental evidence by Dr. Webster, for one, and Dr.
2 Burkes, I think, for the other one. They allowed -- they
3 allowed the evidence in court, both, I think, in Cumberland, in
4 1981. They allowed -- they allowed the same evidence that
5 we're presenting here in the courts back then. The studies
6 haven't changed. They've gotten maybe more involved. But the
7 same thing that I'm trying to present here in front of the
8 Judge today is the same kind of evidence that was presented in
9 the Courts in 1981, and it stood the test -- and it stood the
10 scrutiny in Appellate Court.

11 Q And the studies that you've talked about were before
12 the NAS study, is that -- in 2009?

13 A Is this the NAS study?

14 Q Yes.

15 A Okay.

16 Q Is that correct? The cases that you're familiar with
17 happened before 2009?

18 A Yes, they are. They did happen before 2009.

19 Q Sir, you talked about that there was some unique
20 characteristics of Jonathan Richardson --

21 A I did.

22 Q -- in this case. What percentage -- what -- can you
23 cite any studies that talk about what percentage of the
24 population have those unique characteristics?

25 A There are no studies to indicate that. To my

1 knowledge, anyway.

2 MR. BROUN: If I may have a second?

3 THE COURT: You may.

4 BY MR. BROUN:

5 Q And the American Board of Forensic Odontology --
6 Am I pronouncing --

7 A Yeah, perfect.

8 Q -- says that, "Terms assuring unconditional
9 identification of a perpetrator are not sanctioned, is the
10 final conclusion;" you would agree with that?

11 A I do.

12 Q Okay. And, sir, you've talked a lot about -- earlier
13 we talked a lot about your testimony and your expertise.
14 You've done a lot of work post mortem identifications; correct?

15 A Not a lot, but I have done it, yeah. You know,
16 again, in this system, you know, my identifications were done
17 in the military system, sir. In the civilian system,
18 everything goes to Chapel Hill.

19 Q Okay. But you've done -- you've done --

20 A Yeah.

21 Q I think you've cited, maybe, you worked on the James
22 Jordan case?

23 A I did.

24 Q So you -- that's identifying whether people's teeth
25 match?

1 A Yeah, and you're comparing ante mortem to post mortem
2 records.

3 Q And the other parts that you've generally testified
4 to have regarded whether or not teeth marks were made, in
5 general; correct?

6 A Yes, sir.

7 Q Okay. Thank you.

8 MR. BROUN: I have no more questions at this time.

9 THE COURT: Redirect?

10 MR. JACKSON: Just a couple of questions, if I may?

11 THE COURT: Yes, sir.

12 REDIRECT EXAMINATION BY MR. JACKSON: 3:19 P.M.

13 Q Doctor, with regards to the email that you sent, you
14 talked about certain factual information. But with regard to,
15 you said that, "I do not consider myself to be a bite mark
16 expert," can you explain that? Do you feel like that you are
17 qualified to give opinions regarding bite mark identification?

18 A I do. I do believe that I'm qualified to give
19 opinions. By that remark, I merely meant, there was a
20 psychological aspect to that remark, and there was a
21 scientific, or a professional aspect. The professional aspect
22 of that remark was I wanted the Courts to know that I wasn't
23 board certified by the American Association of Forensic
24 Sciences. And the psychological component you already know.

25 Q With regards to the -- any criticisms regarding the

1 field of forensic odontology or forensic dentistry, with
2 regards to bite mark evidence, despite the criticism from
3 whatever source, do the methods and procedures that you
4 utilized, are they accepted in your field, and do you consider
5 them to be reliable principles in that?

6 A I think one of the past presidents of the American
7 Board of Forensic Odontology was a female a couple of years
8 back, took a stand about dental evidence. And so she addressed
9 a lot of the points that the Defense is addressing right now.
10 And I think in her defense, and in the defense of this
11 evidence, I -- she was trying to describe the fact that there
12 is no statistical value, like DNA, for example, or fingerprint
13 data. So there is -- there is -- there is a conundrum here.
14 We cannot put a numerical value on the evidentiary value of any
15 bite mark. And so then it becomes an experiential one. And so
16 I agree that that -- there is no numerical value, but I do
17 think that after twenty, thirty years in this field of
18 dentistry, that sound conclusions can be made.

19 Q Okay. Do you believe that the methods that you
20 utilize and that are utilized in the field, and the principles
21 that are utilized in the fields, are reliable and accepted?

22 A They are definitely accepted, and reliable to the
23 degree that the Courts allow them to be accepted.

24 Q With regards to, when you're saying the -- bite mark
25 evidence is different than DNA evidence or fingerprint

1 evidence?

2 A That's what I'm trying to say.

3 Q And the -- can you -- and so can you comment on the
4 comparison -- comparing bite mark testimony, or that science,
5 with regards to trying to compare it with DNA or something
6 that's different?

7 A Incomparable.

8 Q Okay, why are --

9 A Why are they incomparable? Because there are
10 statistical values placed on one in three trillion, or whatever
11 that is. You know, DNA is so specific. It's a scientific
12 entity with genes and chromosomes. And that's not the case
13 here. Although there are genes in -- there is DNA in a tooth,
14 and we hope that most of forensic examiners are smart enough to
15 take DNA swabbing of bite marks. That was not done in this
16 case, for whatever reason. But in the event that -- that an
17 examiner takes a swab of a bite mark, they can hopefully
18 accumulate DNA evidence from that bite mark, and even a blood
19 type from that bite mark, if it's taken. So that's also very
20 instrumental in the analysis of the dental evidence. But there
21 is flexibility. I mean, the Defense has proven, and I agree,
22 that there is -- there is flexibility in the -- in the
23 interpretation. But when there are enough unique
24 characteristics and concordant features, you can't be blind to
25 that -- to that -- that evidence. And in this particular case,

1 we have both. We have unique, and many concordant features.
2 MR. JACKSON: Those would be my questions.
3 THE COURT: Recross?
4 MR. BROUN: If I may have one minute, your Honor?
5 THE COURT: Yes, sir.
6 (Mr. Broun and Mr. Klinkosum confer.)
7 MR. BROUN: No more questions, your Honor.
8 THE COURT: Thank you very much, Doctor.
9 THE WITNESS: Thank you, Judge. Thank you, folks.
10 (The witness steps down.)
11 THE COURT: By agreement, he may take the
12 impressions?
13 MR. BROUN: Yes, yes.
14 THE WITNESS: And then leave all this here, right,
15 for the clerk?
16 MR. BROUN: Yes, that's fine.
17 MR. JACKSON: Yes, that's been introduced.
18 THE COURT: Further evidence for the State?
19 MR. JACKSON: Not from the State, your Honor.
20 THE COURT: Any evidence for the Defense?
21 MR. BROUN: No, your Honor.
22 THE COURT: You're going to go first or waive?
23 MR. BROUN: I'll go second.
24 MR. JACKSON: The question, your Honor, is, one,
25 under 702 --

1 THE COURT: Excuse me. Before I hear arguments,
2 you had an exhibit marked, a publication from some --

3 MR. BROUN: Yes.

4 THE COURT: -- periodical as Exhibit 2. You did
5 not offer it. And frankly, under Rule 803, subsection 18, if
6 there is an objection, I don't know that the article itself is
7 admissible, though certain statements from it might be. Did
8 you get what you wanted to from the witness on cross?

9 MR. BROUN: I think I did.

10 THE COURT: All right, so you were not offering,
11 then, the --

12 MR. BROUN: It was my original plan to offer it,
13 but I believe the doctor, based on his answers, I didn't offer
14 it.

15 THE COURT: All right, I just wanted to be clear
16 about that, because the clerk asked me about your exhibits, and
17 I told her the only -- 1 is received; you're not offering 2?

18 MR. BROUN: Yes, that's right.

19 THE COURT: All right. Yes, sir, Mr. Jackson?

20 MR. BROUN: Excuse me. I think Exhibit 1 that we
21 offered is on the floor right now. If I may retrieve it and
22 put it --

23 THE COURT: Yes, sir.

24 MR. JACKSON: The question before the Court is, one,
25 is the testimony of Dr. Barbaro, or Barbaro, is it based upon

1 sufficient facts or data; two, is the testimony the product of
2 reliable principles and methods; and three, did the expert
3 apply the principles and methods reliably to the facts in the
4 case. Obviously, it is scientific, technical, specialized
5 knowledge that certainly would assist the trier in
6 understanding the evidence to determine the facts. And he is
7 qualified, through his training, education, and expertise.
8 He testified as to the procedures that are conducted. And his
9 testimony is consistent with what I'm going to hand the Court
10 -- I know that your Honor has access to Lexis, but we start
11 with the Temple case, and that was the Temple case. I think
12 we're all familiar with the Temple case, and that's when it was
13 accepted by the Court, bite mark evidence was accepted by our
14 Court, Superior Court. I've got that. I also have some of the
15 other cases that follow, which is Green, also Thomas, and
16 Anderson. I've got copies. I haven't stapled them yet; I'm
17 sorry.

18 (Mr. Jackson staples documents.)

19 MR. JACKSON: The question is not whether or not the
20 Courts have accepted the evidence, accepted the science of bite
21 mark evidence, in each one of those. And in the Temple case,
22 the qualified expert was an odontologist, there was no -- there
23 was no -- there was no question or concern about whether or not
24 they had been board certified by some particular board or
25 agency, some national board or agency. The question is whether

1 or not they were a forensic dentist or odontologist. And they
2 were. And they were called in to conduct an analysis. And
3 they did exactly rely upon the principles and methods that this
4 expert witness relied upon, basically taking photographs,
5 taking impressions, taking a mold of the Defendant's teeth, and
6 then making comparisons regarding unique characteristics. And
7 in the Temple case, one of the things that the Courts looked at
8 is the fact that, you know what, this -- a dentist that's been
9 practicing for so many years is uniquely qualified, first of
10 all, to testify to the unique qualities of teeth and how people
11 have individual unique characteristics, which I understand
12 cannot be confused with DNA evidence or fingerprint evidence,
13 because unique characteristics do not always mean that they
14 will transfer onto a proper surface, like fingerprints. You
15 know, you don't always get reliable ridges, because the manner
16 in which it's -- an impression is left; it's smudged or
17 whatever.

18 Then the Courts have accepted it, and they talk about
19 the methodology used. They talk about the methodology, and
20 they accepted the methodology, where you're taking pictures,
21 you're examining it, and you're comparing points of comparison.
22 And in that case, I think there were eight points of
23 comparison, and we have well beyond eight points of comparison
24 in this case.

25 Well, it doesn't end there, because each -- our

1 Courts continue, your Honor, to -- you know, this evidence is
2 accepted, this science is accepted by our Courts. And I
3 understand that our law has changed somewhat, and I understand
4 that the Defense will rely upon that change in the law for --
5 but you look at each of the cases, and they talk about that
6 these are reliable principles that are being used. And just
7 because, you know, there may be some criticism of a particular
8 science doesn't mean that it's not reliable or accepted. All
9 science has criticism. You can't find any science without
10 criticism, so you can't just throw studies or articles that
11 criticize a particular science, and say, "Ha! It's now time to
12 overturn it." And it hasn't been refuted, it has just been
13 criticized because it's not DNA, because it's not fingerprint,
14 and it doesn't lend itself to that type of comparison. Just
15 like, you know, tool mark, or bullet comparison, ballistic
16 comparisons, tool mark comparisons. That is a science. That
17 is a science that is accepted, but you don't have that
18 statistical analysis in that situation either.

19 And each one of those cases, the witnesses were
20 allowed testify that the defendant was the one who made the
21 marks, based upon their analysis. And you don't do that in a
22 vacuum. And I think that that's one of the things that it's
23 important to recognize, that there is a lot of -- the totality
24 of the circumstances, all the information that the doctors and
25 the experts are taking in to form their -- to form their

1 comparisons.

2 Okay, so the law changes, and with regards to the
3 Rule 702. And I think that this is based upon the statute that
4 our Courts have recently held, that this is basically a
5 codified version of the Daubert standard. And that is, the
6 statute asks whether or not the testimony is based upon
7 sufficient facts or data, the testimony is the product of
8 reliable principles and methods, and whether or not the witness
9 has applied those principles and methods.

10 This is a field that has been accepted and accepted
11 and accepted. I have, your Honor, may it please the Court,
12 State v. Trogden. And that is a 2011 case, which deals with
13 bite mark testimony, and that has accepted bite mark testimony.
14 And it clearly states, and this is after the change in the
15 statute --

16 May I approach, your Honor, with a copy of --

17 THE COURT: Yes, sir.

18 MR. JACKSON: -- this particular case?

19 (Document handed up to the Court.)

20 MR. JACKSON: Your Honor, this is a 2011 case, where
21 the odontologist was allowed to testify. In fact, they were
22 allowed to testify not only that it was -- the bite marks were
23 consistent --

24 It was the same methodology that's used -- that's
25 been used throughout the history of bite mark testimony.

1 -- that not only was it consistent, but she did
2 testify that the defendant in that case was the one who
3 committed, or who made the marks. And that was based upon the
4 suspect pool that she had, and she said he was the one.

5 The Court didn't address the issue. And then the
6 defense in that case then said, hey, wait a minute, they can't
7 say that. They can't -- you know, that is invading the
8 province of the jury by saying that it was the defendant.

9 Now, there was a discussion in that case, the fact
10 that over the course of bite mark testimony history in the
11 Courts, it's been accepted and an identification, that direct
12 opinion has been accepted by the Courts. It didn't rule on
13 that issue. It said, "We're not ruling on the issue," but they
14 said that if -- even if that were the case, if that were error
15 to do that, then it wasn't prejudicial because it didn't make
16 the proper -- they said it wasn't prejudicial.

17 Now, what they did say in that case, and at the very
18 least what they said in that case, is that we -- that we
19 acknowledge -- the defense acknowledges and the Courts
20 acknowledge that bite mark identification testimony is accepted
21 and is approved by the Courts when a wit -- a qualified expert
22 is always allowed to testify that the bite mark were consistent
23 with. They accepted that. That the bite marks made are
24 consistent with being made by the defendant. And I gave me --
25 I gave away my copy, so I can't point to the exact page. But

1 it -- it is in there. So at the very least, the testimony of
2 this witness should absolutely be allowed to testify as to what
3 he did, what he observed, and his opinion that the bite marks
4 were consistent.

5 But I believe, your Honor, based upon the case law,
6 that he should also be allowed to testify that based upon his
7 infor -- the information that he's received, that the
8 Defendant, to a high degree of certainty, the Defendant is the
9 one who made these marks. And that's because of the unique
10 identification of the Defendant's teeth, the way they matched
11 up perfectly, highly consistent matches from the -- from
12 different points. In the -- as I said before, in the typical
13 case, they talk about eight points of comparison, with only,
14 like, one or two bite marks. Here we have -- one of the things
15 I want the Court to consider, is the plethora. I think the
16 witness testified it's like the mother load of all bite mark
17 evidence, because the quality and the quantity of the evidence
18 on Teghan, the bite marks, the sixty -- over sixty bite marks
19 on her; not only the number, but the quality. And so he's able
20 to make -- use these accepted principles to make comparisons
21 from the model of the Defendant's teeth, he's able to make
22 comparisons not just to one bite mark but to multiple bite
23 marks. And it's every single time, the unique characteristics
24 consistently match.

25 Now, he acknowledges, that, yeah, because of the

1 surface of the skin, you're going to have a little bit of
2 variance, but that is the reality of the science.

3 There has been nothing to refute, your Honor, the
4 fact that from Temple up until 2011 with the most recent case,
5 after the change of the law, there's nothing that has been
6 presented to refute that bite mark testimony, as applied in
7 this case, and applied generally, is not a reliable means of
8 science or forensic science, that it should not be used. There
9 are just criticisms that say, you know what, it's not DNA
10 evidence and it's not fingerprint evidence.

11 I would ask the Court to allow, to find that the
12 testimony is based upon sufficient facts or data, an extreme
13 high quality and quantity of evidence; the principles that were
14 relied upon are the principles that have been accepted by the
15 Court since the Temple, and up until 2011, the most recent
16 case, Trodgon. And he applied those reliably to the facts in
17 the case. And I want the Court to take into consideration the
18 number, the quantity and the quality of the evidence in this
19 case.

20 Doing the research regarding this particular issue, I
21 looked at other forensic science, and the mention bite mark
22 testimony when you're talking about footprint testimony, for
23 example, you're talking about tool mark testimony, for example.
24 Just because it is not statistically susceptible to analysis
25 like DNA is, or like fingerprints are -- they don't have a --

1 no, we don't have a bite mark data bank, but that misses the
2 question of what is being done here, and this type of science.
3 This type -- that's like comparing apples and oranges. This is
4 a science when you are comparing impressions, very simply, tool
5 mark, tool mark impressions that are made on a particular
6 surface. And when you have a tool that is so uniquely, has
7 such unique characteristics, I think it supports the
8 conclusions that you've seen here, and the conclusions that
9 have been accepted since Temple and up until Trogdon.

10 That would be my argument.

11 THE COURT: What says the Defense?

12 MR. BROUN: We are basing our motion on new Rule
13 702, Rule 403, due process clause of both the State
14 Constitution and the United States Constitution, and cruel and
15 unusual punishment parts of the -- of both constitutions.

16 I just -- the first thing I want to say is, he
17 testified -- and this is nothing that we say, in no way
18 impugning the good doctor here, and he's certainly sincere and
19 all. But he testified, and the most important thing that he
20 said is, "There is a sixty-three percent error rate." It is
21 wrong sixty-three percent of the time.

22 In doing this, let's look at the expert himself. And
23 again, this is in no way meant to be disparaging on him, and
24 that he is qualified to testify in many fields regarding
25 forensic odontology, including the field about identifying

1 bodies. But he has never testified as to using the science
2 that we talk about there to testify about a bite mark match
3 before. There's a little bit of confusion, but he seemed to
4 have testified that the previous case, almost twenty years ago,
5 that he knew the bite mark was done because the defendant told
6 him he did the bite marks. That is different. He said could
7 testify, but that's what was done for him.

8 He said in the email that he did not consider himself
9 to be a bite mark expert; he is not. He does not have his
10 boards with the American Society of Forensic Sciences. That's
11 not the major point that we're basing on, but I think it's one
12 of the factors.

13 There's no history of his test results and his
14 analysis being checked out and verified, things that we require
15 of SBI lab technicians, other scientists who are in the
16 business of doing matches. He doesn't have that. He has no
17 error rate that he can produce, because it's never been done,
18 about it.

19 Problems that occurred in this task specifically,
20 there was no comparison to any other teeth impressions at all,
21 none to Helen Reyes, none to anybody else who could have had
22 contact with Teghan Skiba in this case. There's no fact that
23 it was compared to any test, any teeth marks, or any
24 impressions in the world other than Jonathan Richardson's, with
25 it. That's different than the case that Mr. Jackson stated, in

1 Trogdon. In Trogdon, the dentist there compared it to the five
2 other suspects, and said, of those five, this is the guy who
3 matches. We don't have that here. We have one teeth mark
4 being compared.

5 There is no statistical probabilities that are listed
6 here. And before we say, oh, we don't need to do that, and
7 DNA, we have to -- except for DNA, and it's different than DNA,
8 let's take a look, your Honor referred before we started the
9 hearing, to the McGrady case came out. On page 20, and
10 assuming you have the same copies I do, they talk specifically
11 about rejecting the expert because there was no statistical
12 probabilities, there was no error rate. And this was an expert
13 who had testified numerous times throughout the State, under
14 the old 702. But the Court found, looking at it, that it was
15 proper to exclude his testimony in that case, under that
16 situation.

17 And he did it, and we all have to do things to watch
18 to make sure -- and this is true of any scientist and doing it
19 all -- to make sure that we don't have biases in it, and coming
20 through, he did it knowing the nature of the crime, and that
21 the only suspect in the case, from both what he saw and from he
22 what he Googled, was Jonathan Richardson.

23 And that has to be a factor in evaluating it too.

24 It is clear, as he testified, that the bite marks
25 that he then analyzed had occurred days beforehand, before he

1 had -- before he took a look at it, and skin changes. And
2 that's going to have effect on his ability to do the analysis
3 in this case. And that needs to be another factor the Court
4 considers.

5 But let's take a look at the problems with the
6 methodology. And the question now is, for the Court, is given
7 the change in the Rule, the change in the science that we've
8 heard about, is this still proper to let in? There have been,
9 the doctor testified that there were no scientific studies that
10 show that teeth are unique in human beings. He says that his
11 experience indicates that, you know, that they seem to be
12 unique, but we don't have any scientific studies that indicate
13 that. And that there is certainly no scientific studies that
14 show that even if teeth are unique, that the uniqueness is
15 transferred to unique dentations into the skin. There's no
16 scientific studies that show that as unique, with it. He
17 talked some about Jonathan Richardson having these unique
18 teeth, but he can't put into an statistical probability what is
19 unique about it, what probabilities we're talking about. Does,
20 "unique" mean that he is the only individual with these teeth,
21 or does it mean that ninety-percent of folks? None of that was
22 done because there hasn't been science to do that.

23 There's also no science study that believed that the
24 marks in the skin will remain stable for several days. That
25 doesn't exist, and that's going to be necessary for this to be

1 a reliable part of the test.

2 There is no statistical model that's been developed
3 for this science, and that is a factor, as the McGrady case
4 says, that indicates that it should not be allowed in.

5 There is no evidence that the findings and
6 conclusions can be recreated by other experts in the case. If
7 experts have different ways about it, nothing about that.
8 There is no national data to compare teeth results. Maybe
9 that's not by itself enough with different areas, but when you
10 combine it with everything else that's involved. And -- and I
11 appreciate that this was -- it's an area that I was going to
12 get into, but the doctor brought it up on his own, but I don't
13 -- he talked about cases where it turned out that people who
14 have been convicted, he said, solely on teeth mark
15 identification, have later been proven to be innocent when DNA
16 was done. The fact that this Court cannot solely look at this
17 and say, well, gees, there's other evidence equating Jonathan
18 Richardson to this crime, the question is, is this science in
19 and of itself reliable, reliable enough to make a connection
20 it, reliable enough that the science will not confuse the jury.
21 It just doesn't have the reliability based on what he did,
22 based on the -- his own background and experience, based on
23 what happened in this case and the science.

24 When you combine it all together, it violates both
25 702 and Rule 403, plus the United States and North Carolina

1 Constitutions, and we say that it would be too confusing and
2 too prejudicial to allow this evidence in, and we ask that the
3 Court exclude it.

4 THE COURT: What is your response to what I
5 believe is the State's argument in the alternative, that even
6 if the witness may not testify that this Defendant in fact made
7 mark -- bite marks present on Teghan's body, that bite marks he
8 observed and examined were consistent with the impressions or
9 molds he made of the Defendant's teeth?

10 MR. BROUN: My response to that, your Honor, is
11 without a statistical probability to deal with that, that is
12 going to be prejudicial and mislead the jury, because they're
13 going to hear, consistent with the teeth marks, they're going
14 to hear it match, unless it's done like other sciences here,
15 that can put some type of probability with it, on it. And I
16 think that it would be as prejudicial as allowing the opinion
17 as it is in this form right now, given the fact that it's a
18 field that has a sixty-three-percent error rate.

19 THE COURT: Would you concede that based upon this
20 witness's training and experience, that he can, at a minimum,
21 testify as to the nature of certain wounds he saw on the body
22 of Teghan, particular certain wounds were in fact bite marks,
23 and he could further classify those bite marks by severity
24 using the classification study conducted by Northwestern
25 University School of Dentistry?

1 MR. BROUN: I think that they have other experts
2 who can testify that they're bite marks, because it's involved
3 in every report that they have that they're -- that they're
4 bite marks. I certainly think he's qualified to say whether
5 they're bite marks or not.

6 THE COURT: Do you think he's qualified to say
7 that?

8 MR. BROUN: That they -- yes, bite marks. They
9 have other experts who will say that, too, so I don't think
10 that there's a need for that, but I think he can, he does have
11 expertise to say that these are bite marks.

12 THE COURT: Other experts being medical doctors?

13 MR. BROUN: Medical doctors' testimony.

14 THE COURT: But you're conceding that a dentist --

15 MR. BROUN: (Interrupting.) Yes, I will concede

16 --

17 THE COURT: -- that he is at least --

18 MR. BROUN: -- that he has -- that a dentist --

19 THE COURT: -- is as qualified as a medical doctor

20 --

21 MR. BROUN: (Interrupting.) Yes, I am not
22 disputing that. I am -- I'm more making a 403 argument on
23 that, your Honor. If I may have one second?

24 (Mr. Broun and Mr. Klinkosum confer.)

25 MR. BROUN: We're not disputing that he can say

1 they are bite marks, we're saying he can't say who put them,
2 and give an opinion about who put them there.

3 THE COURT: All right. Recognizing all of the
4 cases cited by the State, which are North Carolina cases,
5 you're intending that revised Rule 702 changes the game that
6 drastically, essentially; is that right?

7 MR. BROUN: It's a combination of argument. It's,
8 one, 702, but it's also has to with the information elicited
9 here about where we are with the science. And information that
10 the doctor talked about on Cross and on some of Direct about
11 the problems with the science, with the two -- I think it's a
12 combination. It's one, 702, which is -- does change the rules,
13 it does change the playing field, but science is a moving
14 thing. And if new evidence comes out about science, that has
15 to be taken into consideration in court. And I believe he was
16 very frank in talking about the problems with it, including the
17 fact that we have this error rate of sixty-three percent, and
18 all the other problems that were pointed out.

19 THE COURT: All right. Do you have any cases you
20 want me to look at?

21 MR. BROUN: The primary case that I may would like
22 you to -- is the McGrady case that I think the Court referred
23 to before we even began this hearing.

24 THE COURT: Well, I want to take this under
25 advisement. I'll do my best to let you know something by the

1 opening statements, at the conclusion of jury selection.

2 All right, anything else today for the State?

3 MR. JACKSON: No, your Honor.

4 THE COURT: Anything else today from the Defense?

5 MR. BROUN: No, your Honor, other than I guess
6 discussing some scheduling issues.

7 THE COURT: Sure, we'll do that. By the way,
8 let's don't forget this issue is also hanging out there
9 regarding your offer of proof on the Batson challenge.

10 MR. BROUN: Yes.

11 THE COURT: All right, what scheduling issues do
12 you have you wanted to discuss?

13 MR. BROUN: I think the primary one concerns the
14 suppression hearing, the motion for suppression hearing, and I
15 know that we have, talking about some other motions in limine
16 and the photographs. And I know that the schedule got kind of
17 messed up this week, with Mother Nature.

18 THE COURT: The suppression hearing to which you
19 are referring would be your motion to reconsider based upon the
20 testimony of some nurse at the emergency room?

21 MR. BROUN: Yes, sir.

22 THE COURT: And you intend that if I rule in your
23 favor, all of the statements are inadmissible, so you wanted a
24 ruling on that prior to the opening statements, I'm assuming?

25 MR. BROUN: Yes, sir.

1 THE COURT: All right, I do think that hearing
2 will take a little less time than the one today, but I don't
3 know. It would seem to me that would take an hour or two. Do
4 you folks agree with that?

5 MR. JACKSON: Well, we don't have any witnesses. I
6 think they're going to present just basically rebuttal. I
7 think they want to present Mary Butler, so --

8 MR. BUTLER: There are a couple of officers --

9 MR. JACKSON: Depending on that testimony, I could
10 put the officers back on, but I don't know.

11 THE COURT: But the officers were not present when
12 this --

13 MR. JACKSON: Yeah, they had no idea --

14 THE COURT: -- conversation occurred between the
15 nurse and the Defendant, were they?

16 MR. JACKSON: No. So I think that it's -- they're
17 going to be presenting the evidence, so the question is how
18 long is it going to take to put on their direct.

19 MR. KLINKOSUM: I would say no more than two hours,
20 your Honor.

21 THE COURT: All right, photographs. I still
22 haven't looked at any.

23 MR. BUTLER: Judge, I will say we -- I have -- we
24 went through the ones at the JMH and Chapel Hill, and
25 eliminated a significant number of the ones at Chapel Hill. I

1 have -- I've had -- I've been having some logistics on this
2 stuff with the doctors, that the doctor with the autopsy, both
3 -- we're of the opinion we're going to be able to eliminate a
4 substantial portion of the autopsy pictures. Most of the ones
5 at JMH we believe will be necessary because --

6 MR. JACKSON: We eliminated some of them.

7 MR. BUTLER: -- we eliminated a few, but the
8 majority of them would be, we would contend -- and as I've told
9 Defense -- I've given Defense Counsel the numbers that we have
10 -- the numbers of the photos so they can pick out which ones
11 that we are going to -- we agree, assuming -- assuming there's
12 not other ones they're taking out. Because there's some where
13 everybody -- we pick one, and there might be two that we take
14 out because one does that, and obviously if we lost that one,
15 that would -- but I suspect that we'll be -- I don't know,
16 there's 170 autopsy photos. I expect to be able pare that down
17 very, very significantly, and, you know, and a very small
18 number; significantly less than that, way less than half. I
19 mean, way less than probably a quarter, and so -- but I've got
20 -- I'm going to work on that over the weekend to be able to get
21 them numbers on Monday.

22 THE COURT: I've been told this for two weeks. I
23 mean, when am I going to see the photographs?

24 MR. BUTLER: Well, we -- we haven't had a chance to
25 hear that. We'd like to have a hearing and let you see

1 whatever photographs are left. I mean, that's -- that's part
2 of the scheduling things.

3 THE COURT: But you haven't even narrowed down the
4 number you definitely propose to use, if I'm hearing you
5 correctly.

6 MR. BUTLER: On -- just on the autopsy ones, but I
7 expect to be able to narrow that down significantly.

8 THE COURT: Over the weekend?

9 MR. BUTLER: Over the weekend, yes, sir.

10 MR. JACKSON: Your Honor, I could make his Honor a
11 copy of all of the photographs.

12 THE COURT: Well, I've tried to avoid that, if you
13 folks --

14 MR. JACKSON: Okay.

15 MR. BUTLER: And that's where we're at. We -- I
16 think out of around sixty-some, we eliminate around a third of
17 the -- of the ones that -- of the ones at J -- at Chapel Hill.
18 We did not eliminate -- we only got three out of forty at the
19 ones at Johnston Memorial. I expect to be able to eliminate
20 the vast majority of the ones at the autopsy.

21 THE COURT: All right, where there photographs
22 taken at UNC Hospital in Chapel Hill also?

23 MR. BUTLER: That's what I'm saying, I've
24 eliminated about a third of those.

25 THE COURT: So how many are left?

1 MR. BUTLER: Around forty-ish, I think. I gave --
2 I think it's around -- there were, like, sixty made; we've
3 eliminated about twenty-one. A little over sixty. There were
4 forty of -- at JMH -- at Johnston Memorial; we eliminated
5 three. Then there was not -- there was some at the -- more so
6 at Chapel Hill than there was by the evidence technician.

7 THE COURT: So you're still talking about a
8 hundred photographs made while Teghan was either hospital, in
9 addition to the photographs?

10 MR. BUTLER: I think you're probably looking at a
11 hundred. That would be about right. But there's probably --
12 that's a hundred out of 170 -- out of almost, probably a little
13 less than three hundred.

14 THE COURT: All right. When do you think you will
15 be in a position to identify which one hundred-plus, whatever
16 you actually are going to want to use?

17 MR. BUTLER: Well, I've identified the ones at JMH
18 and the other ones, the ones at Chapel Hill. The ones at the
19 autopsy, I will be in a position to get them that by tomorrow.

20 THE COURT: So you'll be in a position to let me
21 start looking at photographs come Monday?

22 MR. BUTLER: Yes, sir. And do you want to be -- I
23 thought if you wanted to set up while we're looking at them
24 together, and all, I -- that's -- I'll have them the numbers
25 that we're ready to concede before we even get to that point,

1 that are redundant, or --

2 THE COURT: Well, I don't need to look at the ones
3 that you're conceding are redundant. The only ones I need to
4 look at would be the ones you want to use to which they have an
5 objection.

6 MR. BUTLER: Well, Judge, I guess we need --
7 because if I pick -- I pick one, and I've eliminated three that
8 are just like that, it does make a difference that I've
9 eliminated three that are -- instead of using that one. And so
10 I think that we have eliminated pictures is significant to say
11 that we're trying to reduce the redundancy. Now, if we're
12 talking about, are we just -- let's now show pictures of all --
13 every injury, then -- or let's not show the back, or let's not
14 show this side or that, then that's a whole different issue and
15 everything. Because when we're talking about the photos, we're
16 trying to eliminate -- when we went through, like in the
17 vaginal damage, we would try to eliminate -- we eliminated the
18 majority of the photos that would show the inside of the
19 vaginal canal, but still show the hyman notches that would be
20 missing when he testifies. So there's -- there was a process
21 involved in that. But I think what we've eliminated does go to
22 the fact that -- of what we're asking to keep. It's important
23 in that's respect.

24 THE COURT: Well, Mr. Butler, I've been doing
25 trial work long enough to know, and I've done it as a defense

1 lawyer, as a prosecutor, and as a judge now, to know that you
2 may be offering multiple photographs showing a particular
3 injury, but they're still unique because of the perspective
4 from which they're taken, or the closeness from which they're
5 taken, so they're not necessarily duplicative, whether or not -
6 - would not necessarily be inadmissible just because they are
7 duplicative --

8 MR. BUTLER: Right, that's what we're trying to do.

9 THE COURT: -- or photographs of the same injury.

10 MR. BUTLER: I agree with that, right.

11 THE COURT: But, still, I don't know that if
12 you've got four that you've decided clearly are repetitions, I
13 don't know that I need to look at the other three that you
14 discarded.

15 MR. BUTLER: I don't know that we would -- I would
16 -- I guess -- I would say that we have tried to be very, very
17 careful with this, concise, and we have -- and I would not
18 necessarily say they're pictures that we're saying are
19 duplicative, but we -- but we said we can do without them, we
20 feel like we can -- we tried to narrow it as close as we can,
21 because we felt like it was necessary to try to bring the
22 number down as much as possible.

23 THE COURT: Okay.

24 MR. BUTLER: So I think when you see the pictures
25 that we're asking, I don't know what Defense position is on the

1 ones that we are asking be seen, but we can go through those.
2 But if the Court says -- there's a question about one
3 particular one, then we'll -- I guess we'll deal with it -- you
4 know, we may have eliminated one or two that are similar to
5 that. But I think every one of them has a specific purpose for
6 it.

7 THE COURT: But you think you will be in a
8 position to deliver photographs to me for review, not to hear
9 argument yet, but just for me to review, by Monday?

10 MR. BUTLER: Yes, sir.

11 THE COURT: Well, then --

12 MR. BUTLER: If you -- I didn't realize you wanted
13 us to print them out and review. But I will put the ones that
14 we are -- we -- the ones I've given the Defense on the JMH, and
15 the ones I've said that we want to use for -- that come out of
16 Chapel Hill, and I will do the autopsies -- I will put them --
17 I will pull them into a separate, and burn them onto a separate
18 DVD. And only those pictures will be the ones we'll present to
19 you at that point.

20 THE COURT: I think it will expedite matters
21 greatly if you will submit to me for review in advance, before
22 I hear arguments, photographs that you want to use. Now, if
23 during the course of argument you pull out three and say,
24 "Well, Judge, I've eliminated these three," --

25 MR. BUTLER: Right.

1 THE COURT: -- I understand that.

2 MR. BUTLER: Okay.

3 THE COURT: But just in terms of knowing what I
4 need to rule on, it will help me greatly if I can review them
5 in advance.

6 MR. BUTLER: That won't be a problem.

7 THE COURT: They'll be identified by -- there will
8 be some sort of number or unique identification mark on them?

9 MR. BUTLER: There are numbers. There are unique
10 numbers, like DSC, whatever number, on the ones that we have.
11 I've got -- I'm looking at the autopsy ones right now, and
12 there's some -- we've got them -- we're going to have to do
13 something with that, but if not numbered, we have a group of
14 them that are labeled by what they are on the autopsy. We may
15 do it that way. And so the number -- it may be like -- it may
16 say, "Buttocks 1, buttocks 2," so you'll -- we'll be --
17 they'll be identified specifically, the ones that we -- that we
18 present to the Court. And I apologize, I did not realize that
19 you were going to -- I didn't know we were going to go through
20 them, and we were going to say, this is one, and here's why we
21 wanted to do it, but that would be the argument part that
22 you're talking about. I just -- I just didn't know how you
23 wanted to do it, you know, and I understand now how you want to
24 proceed with it.

25 THE COURT: I may not need to hear argument on all

1 of them.

2 MR. BUTLER: I understand that, and that's what I
3 was thinking.

4 MR. JACKSON: I'll tell the Court, with regard to
5 the JMH photos and the UNC Hospital photos, there is -- the
6 number has remained the same that Defense Counsel has, but I
7 also made a notation as to what it specifically shows, so
8 you'll be able to, on those, you'll be able to see the number
9 and also a brief identifier as to the entry.

10 THE COURT: You folks get the photographs which
11 you want to use, without comment, just so that I can review
12 them and be familiar with them. I should be able to do that
13 overnight. We can take up the photographs issue immediately
14 upon conclusion of jury selection, whether we do that here or
15 back at Smithfield before we bring the jury in. What are you
16 talking about, an hour or two, to argue about photographs;
17 three at the most?

18 MR. JACKSON: Three at most. No more than three.
19 Maybe we can do it in an hour.

20 MR. BROUN: I mean, I don't think that -- I think
21 our arguments can be probably not -- there may be a couple of
22 saying, photograph 92 is really bad. I think we're probably
23 going to be discussing it more, like, in a group, I would
24 think, that some of the photographs should be eliminated, as
25 opposed to us suggested each photograph. So I think that may

1 narrow down the times.

2 THE COURT: Yes, sir. And then there will be some
3 argument, as well. Well, some discussion about how you propose
4 to display or exhibit the photographs.

5 MR. BUTLER: Yes, sir.

6 THE COURT: That may take about as long as the
7 photographs. It depends on what your proposal is.

8 MR. BUTLER: Well, Judge, and again it goes back to
9 that might be something we need to discuss over there, because
10 it's going to be -- it's -- it's -- as the Court's very
11 familiar with the courtroom, the size of the courtroom and the
12 -- and I think we may want to talk to some of the bailiffs;
13 it's going to be the logistics of just putting the extra
14 alternate jurors in the -- it's a small courtroom, and
15 everything, if we're going to be in number 2, and so the
16 question is to try to get it so that everybody can see the
17 pictures and not be -- you know, at the same time be, you know,
18 suitable to -- to all the issues that we need to address with
19 it.

20 THE COURT: Are you going to want to show them --
21 I don't want to get bogged right now, just so I'll know what
22 we're talking about. Are you going to want to show them on a
23 screen or on a monitor of some sort?

24 MR. BUTLER: Well, it would be -- Judge, what I --
25 and, I don't know, we -- but I think maybe we're not going to

1 be able to get what we were thinking we were going to get?

2 MR. JACKSON: We're not going to be able to get the

3 --

4 MR. BUTLER: Okay, we were trying --

5 (Mr. Butler and Mr. Jackson confer.)

6 MR. BUTLER: Okay, well, it's going to be a T.V.
7 There's -- when -- we're trying to get one that's a little bit
8 bigger than the one that we have that they show the jury things
9 on, because the concern is, like if you bring it up close
10 enough to be seen, then people way over here can't see it. If
11 I can get one a little bit bigger, we might be able to pull it
12 back so we don't have to show it two or three times to -- to
13 save time, is what I'm trying to accommodate. I'm just getting
14 told that the TV we were talking about, we were hoping we could
15 get something the size of a seventy-inch TV so we could come
16 back farther, so they could be seen all -- by all the jurors,
17 but we may not be able to do that.

18 MR. JACKSON: It's a little bit bigger, but not
19 seventy inches.

20 MR. BUTLER: It may not be that big, but it's large
21 enough to be able to see. And hopefully, it's going to be
22 large enough to be able to be seen by all the jurors, so that
23 they can talk about -- we're hoping also we're going to be able
24 to set it up, Judge, that there can be a computer at desk, it
25 will be wired -- your desk will be wired, they'll be wired,

1 they'll be wired, and the TV will be wired, so that we can talk
2 about the pictures on the screen to show the jurors, but
3 everybody's looking at it on the computer, and then we can --
4 then once it's approved, they can come up on the screen to be
5 shown there, so the jury -- they'll have one at all four -- all
6 four desks.

7 THE COURT: When you say, "screen," you're talking
8 about television monitors, or a computer monitor?

9 MR. BUTLER: I'm talking about a television
10 monitor. We're not talking about putting it up on the screen,
11 we're talking about -- which will be -- a TV monitor will be
12 smaller than a projection screen.

13 THE COURT: A large enough -- a television or
14 computer monitor large enough for all the jurors to see at one
15 time, and it will be shown simultaneously, perhaps, on our own
16 laptop?

17 MR. BUTLER: That's what our goal is do. We're
18 working with -- we're working with the sound system, to try go
19 get that together. It may not be -- I was hoping to get one as
20 big as seventy-inch, because of just the logistics of it, so we
21 can pull it farther back, but not anywhere near the defense
22 table, but it would be -- but at the same time, it would be, in
23 a smaller one, well, it would have to be pulled a little closer
24 so that everybody can see the thing, and it may be we have to
25 adjust that.

1 THE COURT: All right.

2 MR. BUTLER: But that's the goal. But it will not
3 be a projection screen, not for those photographs.

4 THE COURT: It sounds like basically what we're
5 going to need will be a half a day to a full day of wrapping up
6 these miscellaneous issues, the renewed motion to suppress
7 Defendant's statement, photographs issue --

8 MR. BUTLER: There's motions in limines that we
9 want to address.

10 THE COURT: That's right, other motions in limine.
11 All right, it's probably best just to hear all those matters in
12 Johnston County, I would think.

13 All right, anything else we need to address, Mr.
14 Broun or Mr. Klinkosum?

15 MR. BROUN: No, sir.

16 THE COURT: Anything else for the State?

17 MR. BUTLER: No, your Honor.

18 THE COURT: Okay, regarding our panel, we've got
19 three folks left; one is in the box, and two more. And panel -
20 - is that G --

21 MR. BUTLER: That's F.

22 THE COURT: Panel G is calling in also after 5:00;
23 is that right? Or all of them are calling in?

24 THE CLERK: Everybody's calling.

25 THE COURT: Okay, so the next panel, then, would

1 be G. Eleven o'clock for those folks; does that sound about
2 right?

3 MR. JACKSON: Yes, sir.

4 MR. BROUN: Yes, sir.

5 THE COURT: I mean, we get bogged down and it may
6 take all morning for the three left in there, depending on how
7 they respond to the questions, or we could go through them in
8 an hour also. So let's have the three remaining folks, who I
9 would believe would be Mr. --

10 I've lost his name now.

11 THE CLERK: Mr. Buie is in the box.

12 THE COURT: -- Mr. Buie, and the other two, come
13 on in at 9:30 Monday. Then the next panel, which is G --

14 Is that right?

15 THE CLERK: Uh-huh.

16 THE COURT: -- report at eleven o'clock to the
17 jury assembly room; eleven o'clock Monday. The other panels
18 should call back after 5:00 on Tuesday. I hope we don't need
19 them.

20 THE CLERK: And we can release 2/03?

21 THE COURT: And the venire for February 3 is
22 released. All right, any other housekeeping matters you can
23 think of, Ms. Coats? Anything from anybody?

24 MR. BUTLER: Not from the State, your Honor.

25 THE COURT: All right.

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MR. KLINKOSUM: Not from the Defense, your Honor.

THE COURT: You-all have a good weekend. Please
recess us till 9:30 Monday, Sheriff.

(The proceedings were recessed for the day at 4:12
p.m., to resume at 9:30 a.m. on Monday, February 17, 2014.)

* * * * *

END OF TRANSCRIPT - VOLUME 25

EXHIBIT C

STATE OF NORTH CAROLINA
COUNTY OF JOHNSTON

IN THE GENERAL COURT OF JUSTICE
SUPERIOR COURT DIVISION
FILE NO. 10-CRS-54426

STATE OF NORTH CAROLINA)
)
VS.)
)
JONATHAN DOUGLAS RICHARDSON,)
)
DEFENDANT.)
_____)

T-R-A-N-S-C-R-I-P-T

Volume 41
(Pages 10547-10738)

The transcript of the jury proceedings taken in the General Court of Justice, Superior Court Division, Johnston County, North Carolina at the January 6, 2014, Criminal Session before the Honorable Thomas H. Lock, Judge Presiding.

APPEARANCES:

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Official Court Reporter
Judicial District 11-B
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INDEX

STATE'S EVIDENCE

Witnesses	Direct	Cross	Redirect	Recross
Dr. Richard Barbaro	10549	10640		
Agt. Lindsey Admire	10666	10708		
Andrew Lockamy	10713			

State's Exhibits

Description	Marked	Offered	Received
764 - Photo (dental model)	10570	10571	10571
765 - Aluwax	10571	10572	10572
766 - Photo (defendant's teeth)	10587	10588	10588
767 - Photo (defendant's teeth)	10587	10588	10588
768 - Photo (bite mark impression of victim)	10591	10591	10591
769 - Photo (defendant's teeth)	10593	10593	10593
770 - Box contained defendant's teeth impressions	10593	10595	10595
771 - Box containing defendant's teeth impressions	10593		10595
772 - Cast of defendant's teeth	10595	10595	10596
773 - Cast of defendant's teeth	10595	10595	10596
774 - working model of defendant's teeth, lower arch	10596	10597	10597
720 - Box (cast of defendant's teeth)		10601	10601
775 - Dr. Barbaro's report	10602	10602	10603
763 - Five digital photos of the victim (Dr. Barbaro)	10610	10611	10611
776 - Agent Admire's final report (hair analysis)	10676	10678	10678
777 - Agent Admire's second report (hair analysis)	10677	10678	10678
778 - Agent Admire's third report (tape analysis)	10677	10678	10678
735 - Photo of Facebook page with defendant	10724	10726	10726

DEFENDANT'S EXHIBITS

Description	Marked	Offered	Received
1 - Deposition (Dr. Barbaro)	10645		

1 THE COURT: Members of the jury, good morning.

2 JURORS: Good morning.

3 THE COURT: Members of the jury, in order to
4 accommodate the schedule of the next witness for the State who
5 is from out of town and out of county, the Court with the
6 consent of defense counsel is going to allow the State to
7 interrupt the direct testimony of the witness who was on the
8 stand when we recessed Friday afternoon. Her name was Lindsey
9 Admire.

10 We will pick back up with Ms. Admire later today;
11 is that correct?

12 MR. BUTLER: Yes.

13 THE COURT: And we're going to allow the State to
14 proceed with its next witness. And you may call your next
15 witness at this time.

16 MR. JACKSON: Your Honor, at this time the State
17 calls Doctor Barbaro to the stand.

18 *****

19 DOCTOR RICHARD BARBARO, being first duly sworn, was examined
20 and testified as follows during DIRECT EXAMINATION by

21 MR. JACKSON:

22 Q. Doctor, if you would, could you please introduce
23 yourself to the jurors? Tell them your full name and your
24 current occupation.

25 A. Good morning. My name is Doctor Richard Barbaro. I

1 live and practice in Fayetteville, North Carolina. I've
2 been a general dentist there since 1987.

3 Q. And can you describe for the jurors in your general
4 dental practice what you do? What's involved in your day to
5 day activities?

6 A. I have a busy family practice. So, we see patients
7 from about the age of three to 104 is my oldest patient
8 right now. It's a busy practice. I see or examine
9 approximately 50 or 60 patients a day. I treat personally
10 about 12 to 15 patients a day. So, I'm quite familiar with
11 the science of dentistry and specifically teeth.

12 Q. And aside from your general practice, dentistry
13 practice, are you also involved or called upon to work or
14 examine cases in the field of forensic odontology or
15 forensic dentistry?

16 A. Prior to going into private practice I was in the
17 military. I served in Special Forces there. And in 1984 I
18 received additional training in forensic dentistry through
19 the Armed Forces Institute of Pathology. Over that course
20 of time, over the last 30 years, I do serve especially in
21 Cumberland County as an expert in the field of forensic
22 dentistry to Cumberland County and to the Fayetteville
23 Police Department.

24 I also work closely with a forensic pathologist in
25 Sampson County, Doctor Carl Barr, and get called down to

1 Sampson County periodically to help him with cases that
2 involve bite mark testimony or that involve bite mark
3 evidence.

4 Q. Doctor, what I'd like for you to do is describe for
5 the jurors your training, education, and experience
6 generally in the area of dentistry and then more
7 specifically in the field of forensic.

8 A. To become a dentist you have to go to four years of
9 college. So, I got my degree from Loyola University in
10 Chicago, magnum cum laude in biology. I went to
11 Northwestern University Dental School for an additional four
12 years following that where I trained in general dentistry.
13 And because of a scholarship, I entered the military at Fort
14 Bragg as a general dentist but became involved in the
15 special operations arena where I was sent to Special Forces
16 training.

17 And because of my deployments out of the country
18 they wanted to make sure that I was available to make
19 identifications in the event of disasters overseas which might
20 -- which might involve specifically identifying a deceased
21 individual from their teeth, from their dental records alone.
22 So, that's how I got involved in general dentistry. And then
23 it introduced me to the field of forensic dentistry also known
24 as forensic odontology. They're interchangeable terms.

25 My first course was at the Armed Forces Institute

1 of Pathology up on the Walter Reed campus. That was in 1984.
2 Soon after that while I was involved in my Special Forces
3 training, which is a six-month program at the time, I got
4 pulled out to do a Black Hawk helicopter that you may remember
5 occurring. It was a Black Hawk which had rotor problems and
6 it crashed out near Camp McCall, which is in the western part
7 of Fort Bragg, and it burned for a couple of days.

8 So, my first real live introduction to the field
9 was to make identifications of 16 individuals who had been
10 burning for a long period of time. In 1987, right before I
11 got out of the military, there was a C-130 crash that involved
12 six soldiers, six airmen, and I made their identification as
13 well through dental records.

14 At that point I left the military and started my
15 own private practice. In 1991 there was a homicide in
16 Fayetteville. A State Bureau of Investigation -- the State
17 Bureau of Investigation with the Fayetteville Police
18 Department asked me to become involved and I was sent down to
19 Florida to work with a dentist down there, a renowned forensic
20 odontologist named Richard Suveron who was involved in the Ted
21 Bundy case which was one of the big -- big dental cases
22 involving his -- the prosecution. He was a mass murderer. I
23 don't know if you remember that or not.

24 MR. BROUN: Objection to the reverency.

25 THE COURT: Overruled.

1 A. And so that continued to sustain my training. From
2 there I went through many courses throughout the country. I
3 went to Santa Barbara, California, to do a bite mark case.
4 It was a digital -- digital way to examine bite marks using
5 Photoshop. I've been through many, many courses at Miami,
6 Dade County, where they have a brilliant and beautiful chief
7 medical examiner's office and they're very, very proactive
8 in the dental field. And also in Detroit, Michigan, they
9 have an exemplary medical examiner's office there. And so
10 I've been through course work there.

11 I stay involved in forensic odontology through the
12 case work. Every time I get a case it involves, you know,
13 many, many, many hours of studying just to get involved in the
14 case that you're working and to review literature as you
15 continue through the case. I read journals. I stay on top of
16 the literature every month.

17 Q. Now, with regards -- are there times when you will
18 work a case as a forensic odontologist or a forensic
19 dentist, give your opinion to the police but not testify?
20 Do you testify in every case?

21 A. I rarely testify actually, because most of the cases
22 that are presented to me never really make it to court. A
23 lot of them just -- they don't require my presence in the
24 courtroom. I have testified though on a bite mark case in
25 1991. I think it was in 1994, I forget the exact date.

1 It was a case of the State versus Arnold Hicks
2 involving a child abuse case and ended up being a murder case
3 as well. The deceased was a little boy named Colton Musgraph.
4 I was tendered there as an expert witness in forensic
5 dentistry. I worked with the prosecution and the assistant DA
6 who was working the case with me was more interested at that
7 point, even though I had done the analysis of the bite mark,
8 there was only one bite mark in that case that had any
9 evidentiary value or high evidentiary value and so I did work
10 up that case. But I testified in court only to the presence
11 and the dynamics of bite mark evidence.

12 Q. Were you prepared to give your testimony with regards
13 to whether or not the defendant could have made the bite
14 marks that you talked to the prosecutor about then?

15 A. I did the exact same workup that I've done for this
16 case in taking molds of the defendant or the suspect in that
17 case and matching -- and taking photographs at the hospital.
18 You'll see one to one photographs where we take -- we take
19 photographs of the bite marks in this -- in any kind of
20 dental evidence case we take photographs of the bite marks.

21 And then we use police laboratories to process
22 those photos so that they are an exact replica. We call it a
23 one to one photo. So, they're duplicated in a one to one
24 fashion, which means that one inch on the photo equals one
25 inch on the victim.

1 Q. In that case that you testified, even though you
2 talked to the prosecution and was prepared to give -- and
3 was tendered as an expert, had the defendant admitted that
4 he had bit the child and so it was not an issue?

5 A. That's why neither defense nor the prosecution had me
6 analyze the bite for the jurors in that case. The defendant
7 had already admitted to the bite. He termed it a playful
8 bite or a play bite. And so I was just -- I was just asked
9 in that case to render my opinion as to the dynamic of the
10 bite mark itself, how the bite mark was inflicted, and
11 whether or not in fact that the wound that I examined was a
12 bite mark.

13 MR. JACKSON: Your Honor, at this time I would
14 tender Doctor Barbaro as an expert in the field of forensic
15 odontology, forensic dentistry.

16 MR. BROUN: Objection for the reasons previously
17 stated.

18 THE COURT: Objection overruled. Tender is
19 allowed.

20 Q. Now, Doctor Barbaro, can you explain -- you've
21 mentioned the term forensic odontology, forensic dentistry,
22 you talked about your training and education in that field.
23 Can you explain to the jurors -- they've just heard the
24 words. Can you explain to them exactly what that entails?
25 What does the field of forensic dentistry entail?

1 A. The definition of forensic dentistry or odontology,
2 odont -- dont is Latin for tooth. So, forensic dentistry
3 and forensic odontology is merely the association of
4 dentistry, of dental evidence, and law. So, it's trying to
5 take in the courts dental evidence and work with the legal
6 system.

7 In this case dental evidence on a decedent but
8 there are other areas, too - malpractice and negligence. So,
9 sometimes dentists are called to the courts to determine
10 whether or not a bad outcome in any kind of treatment was due
11 to malpractice or negligence on the provider's part.

12 We've already discussed identification of remains,
13 of human remains. So, when bodies are found, and you see that
14 in the news all the time, when bodies are found and there's no
15 personal identification on those bodies, 99 percent of the
16 time they call on a forensic dentist, a forensic odontologist,
17 to review the dental evidence, the teeth -- the teeth of the
18 decedent and any fillings that they may have and then they
19 start to look for dental records and make the comparison
20 between the victim, the decedent, and the dental records and
21 that's how they can make the comparison.

22 And a lot of time those things are also used --
23 suppose the victim has an artificial knee or hip, you know,
24 and other things like that. So, we all work together to draw
25 the -- the result that the person is in fact the victim. So,

1 we talk about the identification of human remains. We talk
2 about negligence and malpractice. We talk about bite mark
3 evidence and that's primarily the areas of expertise.

4 Q. With regards to forensic odontology or forensic
5 dentistry, are there times when forensic odontologists are
6 called to talk about the nature of a particular bite mark?

7 A. There have been -- there have been two standards. I
8 trained in Northwestern University in Chicago as I told you
9 and they came up with a classification system and they named
10 it after their school, Northwestern University Dental
11 School's Dental Bite Classification. There's another body
12 called the American Board of Forensic Odontology and they
13 have a different -- a different classification system of
14 bites.

15 So, what's the purpose of the classification
16 system? It helps dentists communicate with one another as far
17 as the type of injury that we're dealing with. And it also
18 helps the forensic odontologists in the courts let -- let the
19 jurors and the State and the prosecution -- and the defense
20 know what kind of bites we're dealing with. So, it sort of
21 classifies things.

22 I like the Northwestern system better because it's
23 easier for me to explain to a lay person, a non-dental person,
24 what kind of bites we're dealing with. Out of that
25 classification system, the Class 1 bite is the least

1 aggressive and the Class 5 bite is the most aggressive.

2 Q. Doctor, I want to get back to that in a moment. But
3 I also -- I want you to talk to the jurors about whether or
4 not forensic odontologists or forensic dentists are
5 sometimes called upon to view a particular bite mark on a
6 victim and then determine whether or not a particular person
7 could have made the bite mark or whether or not their unique
8 dental characteristics are consistent with or inconsistent
9 with the bite marks that are found on a victim or whether or
10 not they are sometimes called upon to exclude individuals as
11 not being able to make the bites.

12 So, with regards to a defendant and a bite mark on
13 a victim, are forensic odontologists called upon to make
14 opinions with regards to that?

15 A. I think the most important thing, jurors, you need to
16 understand, is when a forensic odontologist examines any
17 kind of wound, he or she first and foremost have to
18 determine whether in fact it is a bite mark. So, bite marks
19 are toolmarks and they are patterned injuries.

20 And so, if you think about seeing a bite or if you
21 even bite yourself -- and we can talk about that later, but if
22 you bite yourself, you will see characteristics that resemble
23 teeth. And the more -- the more of the mouth that inflicts
24 the injury, the more teeth are present and the more ovoid or
25 pattern they are.

1 So, when I look at a -- when I look -- when I'm
2 called to examine a patient for example, the first thing I
3 look at is is this a bite mark or is it a pattern injury that
4 could have been made by something else, a bite buckle for
5 example, maybe a cylindrical object that was used to inflict
6 an injury. So, the first and foremost thing that I have to do
7 is figure out whether or not it's a bite mark.

8 And there are class characteristics about that.
9 So, we look at whether or not there are tooth marks on the
10 body and if in fact there are tooth marks, what size are those
11 marks. So, an adult has the width of their central incisors,
12 for example, are a certain width - eight to nine millimeters
13 wide. So, if I see a mark that's 15 millimeters wide or a
14 mark that's two millimeters wide, it may not be a bite mark.
15 I've got to think about what else it could be.

16 So, we start to look at -- we start to look at the
17 pattern of the wound and then we look at class
18 characteristics. So, once I'm certain that the wound that I'm
19 seeing on the victim is a bite mark, then I start to look for
20 individual characteristics. What makes this bite different
21 than any other bite. And I will tell you that each and every
22 one of us has teeth but every one of them is different to a
23 certain degree. And that's what makes these characteristics
24 individual characteristics.

25 what causes individual characteristics? where?

1 You might have broken a tooth on a piece of bone or a hard
2 piece of candy or a hard piece of ice. So, that tooth is
3 going to be looking a little bit different than somebody who's
4 teeth are perfect. Some people may have missing teeth. That
5 bite mark's going to be different than somebody who has a full
6 complement of teeth.

7 Some people may have been to the orthodontist and
8 their teeth are perfectly aligned. That bite mark's going to
9 be different from somebody who has very, very crooked teeth.
10 Those are called individual characteristics. And it's the
11 individual characteristics that the forensic dentist or the
12 forensic odontologist uses to try to include or exclude the
13 suspect.

14 Q. And can you talk to the jurors about how do you
15 determine the unique characteristics of a particular person
16 to compare it with bite mark evidence that you may find on a
17 victim?

18 A. Just to reiterate some of those individual points.
19 So, I look -- I look at the bite mark on the individual
20 first and I try to figure out what kind of -- what kind of
21 teeth would have made that bite. I look -- I look at the
22 alignment of the teeth for example. So, that's the very
23 first thing I see.

24 Are all the teeth in alignment? Are all the teeth
25 present? Are there any rotations or are any of the teeth

1 moving in one direction or another? So, instead of a
2 perfectly straight or a horizontal mark, we might see a
3 vertical mark there. We look to see if there are spaces on
4 that wound, on the bite mark. So, it starts to make me think
5 about what kind of teeth the suspect or the perpetrator of the
6 bite would have.

7 After I -- after I get that information and I
8 record those things down on work notes --

9 Q. Let me ask you this question. Once you as a forensic
10 odontologist and you see a victim, do you consider that
11 victim -- and that victim has bite marks, do you consider
12 that to be a crime scene?

13 A. Any bite mark is a crime scene. Any bite mark is a
14 crime scene. And the interesting part about that is most of
15 you are familiar with shows like CSI. You can't turn your
16 television on without seeing those kinds of things. A
17 fingerprint at a crime scene indicates that somebody was
18 there. Somebody was at the crime scene. It doesn't
19 necessarily mean that that individual pulled the trigger,
20 used a knife, stole whatever was stolen. It just means that
21 the person was there.

22 When you have bite mark evidence, it means that
23 somebody bit the person. So, it attaches the defendant or the
24 suspect to the crime scene. So, yes, whenever I look at bite
25 mark evidence, that victim becomes the crime scene. The

1 evidence is part of the crime scene and my job is to try to
2 include or exclude a suspect from the crime scene, from the
3 person who actually made that bite.

4 Q. How do you preserve -- if you do find bite marks on a
5 victim, how do you go about preserving that evidence so that
6 you might be able to compare it later with somebody's --
7 someone else's teeth or unique dental characteristics?

8 A. The great thing about digital photography is I can
9 take hundreds of photos. So, the best way for me to
10 preserve any kind of dental evidence is through photography.
11 We -- most of the time I'm in the presence of nurses,
12 sometimes doctors when I go into these rooms. Most of these
13 things are occurring in what's called -- especially in the
14 case of pediatric victims, I'm always in the presence of a
15 pediatric intensive care nurse and depending upon how busy
16 they are sometimes the doctors are in the room as well.

17 The very first thing I do is take photographs.
18 You have to understand that in most crime scenes there is
19 usually only one or two bite marks. And not all bite marks
20 offer really any evidence of any high evidentiary value.
21 They're not a very good quality.

22 So, sometimes I've been to crime scenes or victims
23 have come to my office and somebody's asked me to examine a
24 bite mark and I can tell it's a bite mark, but in my opinion I
25 don't think there's anything there for me to offer any

1 individual characteristics or any kind of analysis that would
2 help me draw any kind of conclusions as to who may have made
3 that bite mark.

4 And so how I do preserve? Photography. That's
5 the number one standard. We take tons and tons of pictures.
6 We take overviews. So, we take a picture of the body. Then
7 we hone in on certain bite marks. And then we use a ruler and
8 the ruler is a standard. It's called an ABFO ruler and it's
9 from the American Board of Forensic Odontology but
10 non-dentists use the same ruler in any kind of forensic
11 photography.

12 The reference point of the ruler is important
13 because it helps the crime scene people, the experts in
14 photographic reproduction to make sure that they can get a one
15 to one rendition, a perfect rendition, of the bite mark.

16 Q. Why is that important?

17 A. It's important because without that there's so much
18 distortion anyway in the skin and if you don't have a
19 perfect photograph, you can't draw -- you can't make the
20 measurements. So, when I go to a one to one photograph, I
21 can actually measure the width and the dimensions of the
22 teeth on that photograph and I can make the same -- the same
23 measurements off of the suspect's teeth.

24 So, if the suspect's teeth, let's just throw a
25 number out, they are nine millimeters wide and the victim's

1 teeth are nine millimeters wide, I can't exclude the suspect
2 from the crime scene. If the suspect's teeth are ten or 11
3 millimeters wide and the victim's bite mark is eight or nine
4 millimeters wide, I can't include the suspect at the crime
5 scene, they don't match.

6 So, it's important that the photographs that I
7 take help the crime scene professionals as well as myself in
8 preserving that evidence.

9 There's another way I can preserve evidence and I
10 try to do this in every case where there's any indentations.
11 So, if I bite myself, I can see some indentations on my skin.
12 And whenever I go to the hospital and I see bite marks on the
13 skin, I usually will bring impression material with me in the
14 event that I can record that bite mark. So, I'll use -- I'll
15 use an impression material.

16 If anybody's ever been to the dentist and had any
17 kind of crown work done, they put an impression material.
18 It's a rubber silicone based material into a tray and they
19 take an impression of your teeth. That's highly accurate.
20 Very, very, very accurate to microns very, very accurate.

21 well, I use that same exact material when I'm
22 trying to record bite mark evidence at the bedside. And I
23 back that with a material that they use in the emergency room
24 to cast individuals. And so what I do is I have a material
25 that's highly accurately seated up against the skin overlaying

1 the bite of the victim and then I preserve that bite mark with
2 a hard backing on top of that. That way I don't get any kind
3 of distortion from that.

4 There's another way to preserve bite marks and
5 that's actually to cut them out of the skin. I've never done
6 that. That's usually done with the aid of a medical examiner
7 at autopsy. So, the only way that that type of work can be
8 done would be if the victim has died and then at -- upon
9 autopsy, after the examination is done, they can actually cut
10 the bite mark out of the skin and preserve it.

11 Q. Can you talk to the jurors about does the position or
12 the area on the victim's body where bite marks may be found,
13 does that affect your ability to preserve evidence that may
14 be -- or does it affect the quality of the bite mark
15 evidence that you're able to preserve?

16 A. Skin as you can -- bite marks are dynamic. And by
17 that I mean bite marks occur most of the time with movement.
18 And so the person who's making the bite is moving, the
19 person who's receiving the bite is moving, and the skin
20 isn't a -- it's not a perfect impression material. We all
21 know that. We all accept that and understand that. So,
22 there's going to be some movement and there's going to be
23 distortion of some kind.

24 But depending upon where the victim is bitten
25 there will be more distortion. So, if somebody is bitten on a

1 bicep, for example, and maybe they're trying to resist being
2 attacked or bitten, they may have a flexed muscle for example
3 and be bitten on that and there would be a lot more distortion
4 when the muscle was relaxed. So, we would see a huge amount
5 of distortion there for example.

6 On skinny flat-chested people, for example, we
7 would not see as much distortion as we would there. So,
8 typically where we see bite marks, we will see them on the
9 chest, sometimes on the face, noses, buttocks, breasts, breast
10 tissue. And so the less movement of the tissue itself the
11 more accurate the bite mark will be.

12 Q. When you are trying to -- you already preserved the
13 bite mark evidence from the victim. What do you do to try
14 to determine a suspect or defendant's -- how do you
15 determine their unique dental characteristics and what do
16 you do to try to preserve that?

17 A. So, when I have the victim -- we've discussed we take
18 the photographs and those are processed through a crime
19 scene lab and I make the impressions as we've already
20 discussed. And then with -- we need to have suspects. So,
21 suspects are brought to my office and we take photographs of
22 the suspect, of the suspect's teeth, and we make impressions
23 of their teeth, their upper arches and their lower arches
24 and we take bites.

25 So, we then we have a model, a very accurate model

1 of the teeth of the suspects. We have very accurate
2 photographs and sometimes bite impressions made of the bites
3 of the victim and then we try to make the association between
4 the suspect's bite, his models, and the victim's bite mark.

5 Q. Are you trying to determine whether or not you can
6 exclude a particular person to the suspect?

7 A. I think in today -- by today's standards especially
8 the very first bite mark was introduced in the United States
9 in 1950s, 1954. Things have changed over the course of
10 time. And I think that today the most -- the most prudent
11 and most ethical forensic dentist's main job is to exclude
12 the suspect in a case.

13 You need to exclude the case because we talked
14 about things like the skin being able to distort or move and
15 those kinds of things. So, I think the primary responsibility
16 of any forensic dentist is to exclude a suspect.

17 Q. Is forensic odontology or bite mark evidence
18 analysis, is it like DNA or fingerprints?

19 A. DNA is a -- it's a very scientific process obviously,
20 but it's also exclusionary as well. So, dental evidence
21 does not have the same value as DNA evidence has. It's more
22 like tire print evidence maybe or shoe print evidence. You
23 need, for example, with a tire mark or a shoe print, you
24 need to figure out whether the suspect was in the area.

25 Did he drive his car into or near the crime scene

1 and does the tire mark on that car match the tires that the
2 suspect could have been driving? Does the shoe print have the
3 same detail and the same pattern that the suspect's shoes
4 have? You have to use everything in full context.

5 So, when I use bite mark evidence, I'm looking for
6 very individual characteristics and I'm trying to exclude that
7 suspect. Does it have the same sense of scientific value of
8 DNA? No, but you also have to understand that DNA isn't
9 perfect. It's more perfect than anything else we have, but it
10 isn't -- it's not perfect. It doesn't mean we just -- we go
11 down the chromosomes in DNA evidence to include or exclude
12 somebody and that's what I'm doing with dentistry.

13 Q. From time to time are you called upon or does a
14 forensic odontologist examine a bite mark to determine
15 whether or not it was an adult who made the bite mark or
16 whether or not it was maybe a child who made the bite mark?

17 A. That's always an issue because children often bite
18 other children and children often bite parents for example.
19 So, we go back to the idea of class characteristics. As you
20 -- if you've had children of your own know that baby teeth
21 are pretty small and adult teeth are much larger. Almost
22 twice the size actually.

23 So, an upper front tooth on a child may be 5
24 millimeters, 5.5 millimeters wide. And when I say wide, I'm
25 talking about the edges of those teeth. And on an adult the

1 general average for an adult is about 8.7, nine millimeters
2 wide, sometimes all the way up to ten millimeters wide. So,
3 significantly wider.

4 On the lower arch an adult tooth is around six and
5 a half millimeters wide. All of the same -- basically the
6 four adult incisors are about six millimeters wide, on a child
7 about four millimeters wide. Much, much smaller. The other
8 thing to realize is if you've noticed many, many kids don't
9 have to floss because they have spaces in between their teeth
10 for two -- for several reasons. Kids don't floss, it's a
11 great way to keep their teeth clean.

12 But also when the adult size teeth come in, they
13 have room to get into the jaw. So, it's just a way to
14 accommodate the larger teeth. So, baby teeth are much smaller
15 and baby teeth have spaces, generally speaking, in between
16 each and every one of them.

17 And on bite marks as well you have to remember a
18 good bite mark has six upper teeth and six lower teeth in the
19 bite mark. That's the best bite mark you can have although
20 sometimes we do see bite marks have more than six upper and
21 six lower showing depending upon how wide the suspect bit the
22 victim and those things.

23 But most of the things that we're looking at and
24 most of the things that we're trying to analyze are the teeth
25 from the eye tooth to the eye tooth. The cuspids or the fangs

1 that you see, they're also called canine. So, eye tooth to
2 eye tooth on the top and eye tooth to eye tooth on the bottom.
3 Those are the teeth that we're trying to analyze.

4 MR. JACKSON: May I approach the witness?

5 THE COURT: Yes.

6 Q. Doctor, now you've been talking and describing for
7 the jurors what a forensic odontologist does,
8 characteristics of teeth. I want to show you -- first of
9 all, I'm going to show you what has been marked for
10 identification purposes as State's Exhibit 764. Do you
11 recognize what that is a picture of?

12 A. I do.

13 Q. What is that a picture of?

14 A. That is a picture of a model that we use in our
15 office to help demonstrate oral hygiene instructions.

16 Q. And would the actual -- what did you call that, a
17 model?

18 A. This is a model.

19 Q. Would the model help to illustrate your testimony to
20 the jurors?

21 A. It would.

22 Q. And is State's Exhibit 764 a copy of that --
23 photograph of that model?

24 A. It's a photograph of this exact model.

25 MR. JACKSON: State moves to introduce into

1 evidence State's Exhibit 764 for illustrative purposes.

2 THE COURT: Received.

3 Q. Also I've handed you what has been marked for
4 identification purposes as State's Exhibit 765. First of
5 all, what is this thing that is marked State's Exhibit 765?

6 A. Mr. Jackson's holding up a piece of wax that has some
7 aluminum fibers inside of it. It's called Aluwax that I've
8 just been through. But we use this -- we use this to record
9 bites. And under hot water we can move it all over the
10 place. And so this will work because I --

11 Q. That works?

12 A. It works. I don't need another piece. So, this is
13 used to record bite marks. We use it to record bites so
14 that we can orient in the field an upper and a lower arch.
15 So, suppose I cut this in half and I had an upper model and
16 a lower model, if I had you bite down, I could put this in
17 between these two and orient how those -- how the upper
18 model and the lower model were oriented in your mouth.

19 Q. Would State's Exhibit -- the model which a picture of
20 has been introduced into evidence as State's Exhibit 764,
21 would that help to illustrate your testimony to the jurors?

22 A. It would.

23 Q. And would this, what has been marked as State's
24 Exhibit 765, which is now in two pieces, would that help to
25 illustrate your testimony to the jurors with regards to bite

1 mark evidence and what you're looking for?

2 A. Yes.

3 MR. JACKSON: Your Honor, the State moves to
4 introduce into evidence State's Exhibit 765. And I'd also ask
5 -- State moves to introduce into evidence State's Exhibit 765
6 for illustrative purposes. And I'd ask permission for the
7 witness to step down to illustrate his testimony using both
8 the model and State's Exhibit 765.

9 THE COURT: Received and allowed. He may step down.

10 Q. If you would -- and you're the teacher, so I'll let
11 you -- I want to make sure that -- well, start here and show
12 the jurors and if you could use -- which one would you like
13 to use first?

14 A. I'd like to start here.

15 Q. Okay, go ahead.

16 A. So, we use this -- and I'll move. So, we use this in
17 the office just to teach children and adults who are having
18 trouble brushing their teeth how to properly brush all their
19 surfaces of their mouth.

20 But if you could just focus your attention
21 primarily on the teeth from here to here and from here to
22 here. Those are the cuspids or the canines and the incisors.
23 So, when we're talking about incisors, we're talking about
24 central incisors which are the two upper larger ones. And if
25 you look here, you'll see that these two upper teeth are

1 considerably larger than the two side incisors and
2 considerably larger than the lower incisors.

3 So, the upper central incisors are much wider than
4 the lower -- than the upper lateral incisors. And the upper
5 central incisors are significantly larger than the lower
6 incisors. And why is this important? These are the teeth
7 that we bite with. So, when we're biting into a sandwich, we
8 use these things to cut.

9 Incisors means to cut. And so every tooth in your
10 mouth has a different function. But the incisors are the
11 cutters. They're things that bite into the piece of food that
12 you're trying to eat and cut so that you move it further back
13 to start processing it. So, those are the cutters. The
14 cuspids tear, the incisors cut, and it's these teeth that we
15 use in this field of forensic dentistry or forensic odontology
16 to try to analyze the bite left on the victim.

17 If you'll look at this model, it's pretty much
18 ideal. What do I mean by that? The teeth are very straight.
19 They're very straight across and they're in line with one
20 another. So, if we were to take a piece of soft wax and press
21 down against these incisal edges, we would kind of see
22 everything very much in line and all of the impressions would
23 be made similarly in depth.

24 That's another important thing. Do they all
25 impress the material they're biting into with the same depth?

1 And if they are all in line, meaning if I put this down on a
2 flat piece and every single tooth touches, then those teeth
3 will record similarly into that impression material to about
4 the same depth.

5 Q. Can you show the jurors -- make sure that the jurors
6 are able to see?

7 A. So, when I'm talking about things being in line, I'm
8 talking about whether or not the edges of the teeth are on
9 the same plane one to the other. And in this particular
10 case you see that these teeth kind of strike against this
11 wooden top all at the same place. And it's the same thing
12 with the bottom.

13 So, we're just looking at the exact same thing,
14 upper and lower. It's just that the bottom incisors are all
15 about the same size in an adult and even in a child. The four
16 lower incisors, they're all the same width from back to front
17 or front to back. Different on the upper as we've already
18 discussed. The upper incisors are much bigger than the lower
19 incisors and they are of different sizes. So, the centrals
20 are the largest ones, the laterals are a little bit smaller,
21 and then the eye teeth have that really big point to them,
22 that big cusp to them.

23 Q. You mentioned earlier that when you dealing with --
24 how many teeth do you generally -- generally does a person
25 have in their mouth?

1 A. If you've never had your wisdom teeth taken out, you
2 have 32 teeth.

3 Q. And you indicated that when you're looking at bite
4 mark evidence, the most you would ever see is what?

5 A. Sometimes you'll catch the bicuspids, which are these
6 teeth out here. They have the -- they're the one teeth
7 behind -- the one teeth behind the eye teeth, the fang. So,
8 sometimes you'll catch the bicuspids which are the ones
9 before the big molars in the back, but 90 percent of the
10 highest quality, 100 percent of the highest quality bite
11 mark has the cuspids from eye tooth to eye tooth top and eye
12 tooth to eye tooth bottom.

13 So, if we see a bite mark that has 12 teeth in it,
14 upper six and lower six, and they were recorded very nicely in
15 the skin, that's -- that's a home run. It's very, very good
16 -- very good dental evidence. It's the bite mark of highest
17 evidentiary value and that means -- what does highest
18 evidentiary value mean? It means can the forensic dentist
19 really use that information that he gathers from the bite mark
20 evidence and present it in a comfortable way and a confident
21 way to the jurors. So, the higher the evidentiary value the
22 more -- the more value the bite mark has in trying to sell
23 this case.

24 Q. Is it often -- is it rare that you have bite marks of
25 evidentiary value?

1 A. It is rare. You know, you do see bite marks -- like
2 I said, sometimes somebody will come to the office with a
3 bite mark and --

4 Q. Do the police bring them or they come on their own?

5 A. The police will bring them if they're living, you
6 know. Sometimes we'll get bite marks from teenagers in the
7 office and sometimes they want to know if in fact it was a
8 bite mark and can I use that evidence. And sometimes I
9 can't, you know.

10 Bite marks range like from just a little bit of
11 red mark all the way to something that is pierced through the
12 tissue. So, yeah, we're looking for -- we're looking for six
13 upper and six lower teeth in a bite mark.

14 Q. Is it rare to find six upper and six lower?

15 A. It's rare to find with high definition six upper, six
16 lower.

17 Q. Can you use -- would State's Exhibit 765 help to
18 illustrate your testimony to the jurors with regards to bite
19 mark evidence?

20 A. Yes. So, what's -- this is a screwdriver and this is
21 just a piece of wax. You've heard maybe through CSI
22 toolmark evidence. This is a tool and teeth are tools as
23 well. I picked this instrument because it kind of
24 illustrates what a tooth looks like and if I come into this
25 wax -- and this wax is kind of cold so it doesn't -- it

1 doesn't penetrate as well. But if you look in there, I can
2 see the impression that that screwdriver makes.

3 And in this particular case I've made the mark so
4 it's horizontal in relationship to you. You know, I could
5 also make one the opposite way more vertical. But in this
6 particular case I've just made this -- this specific
7 screwdriver perforate the wax so it leaves a mark behind.

8 So, it's a toolmark. This is a tool and that's a
9 toolmark. If my tool -- if my flat head screwdriver was
10 wider, it would leave a wider mark here. So, if I had a ten
11 millimeter wide mark, this screwdriver probably didn't make
12 it. If I used a Phillips head screwdriver and perforated that
13 wax, I could exclude this tool as being the maker of that flat
14 edged impression.

15 So, teeth are tools like a screwdriver. So, then
16 it becomes my job to determine whether or not a suspect's
17 teeth were the tools that made the impression at the crime
18 scene.

19 Q. Or whether they could be excluded?

20 A. Or whether they could be excluded.

21 Q. While you're here, can you talk to the jurors -- are
22 you going to show it all?

23 A. Yeah.

24 Q. Have you shown them everything?

25 A. I've shown it, yes, I have.

1 Q. Will you show the jurors with regards to bite mark
2 evidence, does the force someone bites a victim indicate or
3 will that affect the quality of the evidence that you may
4 see?

5 A. Let me just do it again by -- if I bite myself hard
6 enough 'til it hurts, you can see that I've left an
7 impression in my skin. So, I just bit my hand just like you
8 all can do here and you'll see in about 20 minutes to an
9 hour that that bite mark will be gone.

10 Now, I bit myself to the point of being painful,
11 not to a point of bruising myself, but I bit myself to a point
12 of it being painful. And if you look in there, you can see
13 that I've left an indentation in my skin. And it's not going
14 to take a real long period of time for that skin -- at least
15 for that impression to go away.

16 Q. You mentioned earlier that there are -- you can
17 return to the stand. You'd mentioned earlier that there are
18 different -- unless there was something else you wanted to
19 demonstrate.

20 A. I'm good.

21 Q. There were different levels or classifications of
22 bite marks based upon the force that is used or the amount
23 of force or the ferocity of the bite mark. That one that
24 you just did, what would that be?

25 A. This would be a Class 2 bite mark according to the

1 Northwestern University Dental School Classification System.

2 Q. Just tell the jurors about the different
3 classifications you've got. What's one?

4 A. One would be like a hickey. So, a suck mark where
5 you could tell -- you could tell that a wound was made by
6 lips. Maybe there was some tooth contact there, but there
7 would be no impression of the teeth into the skin. So,
8 that'd be a Class 1 bite mark. Evidentiary value, it's been
9 admitted in courts but very low on the scale of evidence --
10 of evidentiary value.

11 A Class 2 would be the one that I just gave. And
12 that means that there are dental impressions made into the
13 skin. The skin has not been perforated. There are no
14 indentations made through the outer layer of skin, the
15 cutaneous layer. And generally speaking, as I said depending
16 upon how hard you bit yourself and how fragile your skin is,
17 it's going to go away 20 or 30 minutes, in a short period of
18 time.

19 A Class 3 bite mark is more intense. So, with a
20 Class 2, if you folks bite yourself right now as hard as you
21 can handle it, it's going to be a Class 2 because no one here
22 in this room is going to bite themselves that they want to
23 perforate their skin. But a Class 3 bite is one that goes
24 beyond the pain, and I did feel pain, beyond the pain that I
25 felt in biting myself and it actually cuts through the tissue.

1 And how do we know it cuts through the tissue? we
2 see scab marks. You can -- you know, you'll see the presence
3 of a bite mark on the victim but in addition to that you'll
4 see dry blood or fresh blood depending upon how -- how recent
5 the bite was made. That's a three.

6 A four is a tear. So, every one of these bites
7 now includes an increased pain factor and a much more horrid
8 infliction. So, you get to a four, the skin has been bitten.
9 It's been bitten through the outer skin layer, the cutaneous
10 layer, and then it's been torn. So, you have to grab onto the
11 tissue and then you have to pull. So, you've bitten through
12 and you've torn.

13 A Class 5 bite is an avulsion bite where somebody
14 bites down, grabs on, and rips off skin. So, Class 1 would be
15 very little pain, if any. Class 5 would be very, very intense
16 pain, horrible pain.

17 Q. Thank you, Doctor. I want to direct your attention
18 to this case specifically to July the 17th of 2010. Was
19 there a request of you to go from -- travel from
20 Fayetteville, your home where your office is, to Chapel
21 Hill?

22 A. I have a son actually who's a pediatric --
23 pediatrician and he's getting his training in intensive care
24 medicine, but he called me from -- he was on call when
25 Teghan was admitted to the PICU at UNC and he was working

1 with a physician there named -- his boss was Doctor Kenya
2 McNeal-Trice who's a forensic pediatrician as well as a PICU
3 physician. And so they called me to ask me if I could come
4 up to Chapel Hill to examine Teghan.

5 Q. And did you?

6 A. I did. I drove -- I got the call roughly around 6:00
7 in the evening and I got to Chapel Hill I think right around
8 8:30 I believe.

9 Q. Was that on the 17th?

10 A. It was.

11 Q. If you would describe -- what information did you
12 have at that time with regards to just the victim?

13 A. Just the victim. I was told that a child was
14 admitted from another hospital and that she was severely
15 injured and she was covered with bite marks and they were
16 wondering if I could come up to analyze the bite mark
17 evidence.

18 Q. Can you describe for the jurors sort of that point
19 when you arrived at UNC Hospital? Did it take you --

20 A. A couple hours, yeah.

21 Q. When you arrived at UNC Hospital, just walk the
22 jurors through what you observed, where you went, and what
23 you did.

24 A. Doctor Trice met me out in the parking lot of the
25 facility. It's hard to park at Chapel Hill if you ever go

1 up there. So, she had me parking in the physician's lot and
2 she walked me up to the floor where I saw my son actually.
3 But they brought me into the room and I saw a little girl
4 laying in a bed covered with injuries from head to toe.

5 Q. What was your -- when you saw her and saw her
6 injuries, what was your initial reaction? What was the
7 immediate effect it had on you?

8 MR. BROUN: Objection, 403, due process, and for
9 reasons previously stated.

10 THE COURT: Overruled.

11 A. I immediately said a prayer that she would die.

12 MR. BROUN: Objection, motion to strike.

13 THE COURT: Sustained.

14 MR. BROUN: Motion to strike.

15 THE COURT: Motion to strike allowed. Members of
16 the jury, please disregard the last statement of the witness.

17 Q. Had you ever seen anything like that before?

18 A. I've been involved in --

19 MR. BROUN: Objection.

20 THE COURT: Overruled. You may answer.

21 A. I've been involved in this field for 30 years and it
22 was absolutely the worst case of -- I had never seen a child
23 with more injuries. I had never seen a human being with
24 more injuries than I did on Teghan's body.

25 Q. Did you examine her body for bite marks?

1 A. I did examine her body. With Dr. Kenya McNeal-Trice
2 and my son, Doctor Ryan Barbaro's help, we examined the
3 body.

4 Q. She's alive at this time?

5 A. She is alive at this time.

6 Q. And can you tell the jurors specifically with regards
7 to the bite mark were you able to -- did you see bite marks
8 on her body? Was her body a crime scene?

9 A. Her body was covered with bite marks. Many of these
10 children are on life support and whenever you move them
11 around, their heart is really stressed out. So, they're on
12 monitors and when you start to move the body, the heart
13 really races. So, most of my -- most of my examination was
14 on her torso. She was laying on her back. So most of what
15 I examined was just what I could see with her laying down.

16 We did turn her over at one time so I could take some
17 photos of some bite marks on her back as well. But most of
18 my examination was left due to the cardiac stress, the
19 stress on her heart, to just the front side of her body.
20 And there were multiple, multiple bite marks.

21 Q. Were there bite marks on her back as well?

22 A. There were bite marks on her back as well.

23 Q. Were there bite marks on her extremities?

24 A. She was covered with bite marks.

25 Q. What if -- you talked about what you're looking for

1 as far as evidentiary, you're looking for bites of
2 evidentiary value. Can you talk about whether or not from a
3 forensic odontologist standpoint whether or not Teghan
4 Skiba's body had on her body bite marks of evidentiary
5 value?

6 A. She had bite marks of Class 2 to Class 5 bite marks
7 all over her body. But in this particular case I was able
8 to photograph bite marks that showed six teeth and maybe
9 even -- six teeth upper, six teeth lower, so 12 teeth and
10 even on some of the bites eight teeth upper, eight teeth
11 lower. So, they were bite marks with a lot of detail.

12 Some of the things you and I have talked about
13 already as far as recording incisal edges. There was a lot of
14 -- a lot of detail in several of the bites. So, I truly
15 thought that these photos that I took would really help me in
16 my -- my analysis of any suspect. So, the dental evidence was
17 very, very good on the crime scene which was Teghan's body.

18 Q. Have you ever seen another case in which the
19 evidentiary value of the bite marks on a victim were of such
20 high quality?

21 MR. BROUN: Objection.

22 THE COURT: Overruled.

23 A. Never. The fact -- if you look at the literature
24 you'll see that a lot of cases involving bite mark evidence
25 have one -- one bite mark. You know, sometimes they'll have

1 two bite marks and sometimes they're not of really good
2 evidentiary value. So, it makes it difficult with any kind
3 of certainty to make the analysis and draw any kind of
4 conclusions.

5 In Teghan's case the bite marks were extreme --
6 several bite marks had extreme high evidentiary value. So, it
7 was -- I was much more confident in photographing some bites,
8 making impressions of the bites, and using that evidence that
9 I gleaned for analysis later on.

10 Q. So, you had -- you say you took photographs of some
11 bite marks and that you do it on a one to one ratio or you
12 have them produced on a one to one ratio?

13 A. Yeah.

14 Q. And did you do that in this case?

15 A. Sure. So, I take the photographs -- I don't take the
16 photographs necessarily one to one although I try to -- with
17 an expensive digital camera for close up photography that we
18 use in dentistry, sometimes we can zoom in really close and
19 get a one to one shot. It's hard though with lighting and
20 stuff. In a dental office you can do that because the
21 lighting is a little bit different and you can move the
22 patient wherever you want.

23 But when you're trying to take pictures over a
24 bed, sometimes I have to get a stool or a short ladder or
25 utility ladder sometimes to stand up over the victim to take

1 those pictures because you don't want to shoot the pictures at
2 an angle. You want to shoot them parallel to the bite mark
3 and basically you're shooting through the bite mark
4 perpendicular to that bite mark.

5 we take those photos with and without rulers. And
6 so the ruler then allows the crime scene professionals to
7 convert the pictures that I took to a one to one ratio so that
8 we can make the analysis.

9 we also look at photographs that aren't one to one
10 because sometimes we can blow those photographs up to look for
11 individual characteristics. You know, whenever you magnify
12 anything, you can see detail that you might not be able to see
13 without magnification. So, we do use photographs that are
14 magnified or at least of the magnification that we take that
15 you would take of anything.

16 If you take a picture of any object in your house,
17 it's a picture that's blown up basically of the object that
18 you took. But you can have those pictures in a crime scene
19 lab rendered to a one to one photograph. So, you're looking
20 at the exact same thing.

21 MR. JACKSON: May I approach the witness?

22 THE COURT: Yes.

23 Q. So, did you have your photographs sent to a lab so
24 that they could produce them in one to one ratio?

25 A. I have a good relationship with the Fayetteville

1 Police Department and their crime scene investigators. They
2 have an excellent photo department and they always process
3 my film for me.

4 Q. I'm going to hand to you what has been marked for
5 identification purposes as State's Exhibit 766 and also
6 State's Exhibit 767. Do you recognize the photographs that
7 have been marked for identification purposes as State's
8 Exhibit 766 and 767?

9 A. I do, these are photographs that I took that the
10 Fayetteville Police Department processed for me.

11 Q. And did you use these particular photographs, State's
12 Exhibit -- what has been marked for identification purposes
13 State's Exhibit 766 and 767, did you use those when you were
14 conducting your analysis in this case?

15 A. I used these photographs and many others to make my
16 -- to do my analysis.

17 Q. There seems to be some numbers on some of them,
18 what's that? Did you put those numbers there?

19 A. Yeah, I put these numbers -- every tooth in your
20 mouth has a specific number. It's again a way for us to
21 communicate from one dentist to another or from one dental
22 laboratory to a dentist. So, we mentioned before that if
23 you don't have your wisdom teeth out, you have 32 teeth in
24 your mouth. Well, every single tooth in your head has a
25 specific number in the universal numbering system.

1 So, the upper right tooth for example is your upper
2 right wisdom tooth, that's tooth number one. The upper left
3 is tooth number 16. Then it drops down to 17 to 32. So,
4 the central incisors, the upper central incisors, those
5 numbers are eight and nine. So, if you back off, and we've
6 talked about the bite mark evidence and we're looking at
7 cuspid to cuspid a lot of times, so it's six, seven, eight,
8 nine, ten, 11 and on the bottom it's 22 to 27. So, the two
9 central incisors on the bottom are numbers 24 and number 25.

10 So, you'll see on these photographs that when I'm
11 trying to do my analysis, I'm actually numbering the dental
12 photographs with tooth numbers. So, it lets me -- as you're
13 going back and forth, these things are reversed. So, as
14 you're going back and forth it helps eliminate confusion so in
15 your own mind's eye you're not getting confused as to what
16 you're looking at.

17 Q. And would State's Exhibit 767 and -- 766 and 767 help
18 to illustrate your testimony to the jurors?

19 A. It would.

20 MR. JACKSON: State moves to introduce into
21 evidence State's Exhibit 766 and 767,

22 THE COURT: State's Exhibits 766 and 67 are
23 received.

24 Q. Now, so you took the photographs. Those weren't the
25 only photographs you took?

1 A. I think I took about 100 photographs.

2 Q. You say sometimes you have bite marks that are of
3 such high evidentiary value or they left an impression that
4 you can take a cast of it or take an impression, can you
5 describe that process?

6 A. So, you have -- you have photographs and possibly
7 impressions of the victim's bite marks. Well, you have to
8 match those up with the person who made those bite marks.
9 Otherwise there's no association made. So, then the courts
10 produce suspects to me. Suspects are brought to my office
11 and we take photographs of the suspect's teeth and then we
12 make impressions of the suspect's teeth. And from those
13 impressions I send those to a dental laboratory and I have
14 those impressions poured up into a model that duplicates the
15 individual's teeth of the person that I took the impressions
16 of.

17 So, if I took an impression say, for example, of
18 Mr. Jackson, the attorney's mouth, I would have that
19 impression sent to a laboratory where his impressions would be
20 poured up in a high density stone and that stone would then
21 duplicate what his mouth looked like so that I can study those
22 in my office or at home or where I work and start analyzing
23 Mr. Jackson's teeth in this example to the bite marks that I
24 found at the crime scene.

25 Q. I think that my question sort of made you jump

1 ahead. what I want to --

2 MR. JACKSON: May I approach the witness?

3 THE COURT: Yes.

4 Q. So, that's the process of getting a cast or an exact
5 duplicate of a suspect's mouth.

6 A. Right.

7 Q. Do you also take impressions from the crime scene
8 itself, the victim's body?

9 A. If I see -- if I see a bite mark that may be
10 recordable, I take the impression. And my premise is this,
11 if I don't take it, I won't know if I can get anything on
12 there or not. And so what I did in Teghan's case was I
13 looked for the bite marks that had the deepest indentations.

14 You have to -- you have to put in perspective that
15 I didn't see Teghan for 36 hours after she was admitted
16 through Smithfield. So, when she was first identified as a
17 possible victim of bite marks, I didn't get to see her for 35,
18 36 hours. So, the indentations weren't as deep as they were
19 when I first bit myself in front of you. But, there were
20 indentations there. So again going on the premise that if I
21 don't try, I'll never know, I did in this particular case make
22 an impression of some indentations under her left breast.

23 The way I did that was I used an impression
24 material like I would use in any other dental procedure and
25 then I backed it, as we talked about before, with a casting

1 material and then I brought that into -- brought that back to
2 the office and I've kept that in my custody for the three
3 years since the -- since the initial analysis.

4 Q. I'm going to hand to you what I've marked for
5 identification purposes as State's Exhibit 768. What is the
6 item that I've marked for identification purposes State's
7 Exhibit 768?

8 A. So, this is the impression I made with the material
9 we just discussed of Teghan Skiba's left -- a bite mark on
10 Teghan Skiba's left torso underneath her left breast.

11 Q. And did you utilize what has been marked for
12 identification purposes as State's Exhibit 768 in your
13 analysis?

14 A. I did.

15 MR. JACKSON: Your Honor, the State moves to
16 introduce into evidence State's Exhibit 768.

17 THE COURT: Received.

18 Q. You talked about the process by which -- you got
19 pictures of the victim, you've got pictures of the bite
20 marks on the victim's body, you made an impression of the
21 bite mark on Teghan's body. At some point in time were you
22 given an opportunity to create a cast or document this
23 defendant's unique dental characteristics?

24 A. I did. One of the detectives from Johnston County
25 brought Jonathan Richardson to my office where with his

1 permission and a search warrant we made impressions, took
2 photographs, and bites of the defendant's.

3 Q. And did you do that in sort of the process that you
4 were describing earlier where you described like if you were
5 going to take a cast of my teeth?

6 A. Right.

7 Q. Does that create an accurate reflection of the unique
8 dental characteristics of the individual?

9 A. The most accurate that there is in technology today.
10 So, we make this impression and we use this same type of
11 impression to make dental ceramic crowns for example.

12 So, if somebody needs a crown because they've
13 broken a tooth or the same types of things that you see in the
14 movie stars' smiles, those are all done the same way where
15 preparations are made of teeth, impressions are made of those
16 preparations so that those crowns can be fabricated and they
17 have to fit so that bacteria cannot infiltrate past the crown
18 margin.

19 Bacteria are pretty small. And so for an
20 impression to be able to duplicate what kind of preparation
21 you did it has to be highly accurate. And the point I'm
22 trying to make is the material that I used to record that bite
23 and dental -- that bite off of Teghan's body and the
24 impression material that I used to take impressions of the
25 suspect teeth is the same material that is used to create

1 dental prostheses of the highest quality.

2 MR. JACKSON: May I approach?

3 THE COURT: Yes.

4 Q. Did you photograph the defendant's teeth?

5 A. I did.

6 Q. I'm going to show you what has been marked for
7 identification purposes as State's Exhibit 769. Do you
8 recognize what is depicted in State's Exhibit 769?

9 A. This is a photograph -- actually two photographs
10 printed on one piece of paper of Jonathan Richardson's
11 teeth.

12 Q. And would they help to illustrate your testimony to
13 the jurors?

14 A. They would.

15 MR. JACKSON: State moves to introduce into
16 evidence State's Exhibit 769.

17 THE COURT: Received.

18 Q. I'm going to now show you what has been marked for
19 identification purposes as State's Exhibit 70 -- I'm sorry,
20 State's Exhibit 770 and State's Exhibit 771. Do you
21 recognize what is contained in these boxes that have been
22 marked for identification purposes State's Exhibit 770 and
23 771?

24 A. I do. Again, these are the impressions I made of the
25 suspect Jonathan Richardson's teeth, the upper cast or the

1 upper model and the lower model.

2 Q. which one's the upper and which one's the lower?

3 A. The upper model is the one that is solid green all
4 the way across. That's recording the roof of the suspect's
5 mouth.

6 Q. what number is that? what State's Exhibit Number is
7 that?

8 A. 771.

9 Q. That's the upper?

10 A. So that's the upper impression. And then State's
11 Exhibit 770 is an impression of the suspect's lower arch.
12 And the reason we can tell that is you'll see on the bottom
13 that there's white there instead of green. That's because
14 that's the area where the tongue sits. So, we can't -- we
15 cannot record the tongue when we make the impression of the
16 lower arch.

17 Q. would those help to illustrate -- are these the casts
18 that you took of -- what do you call those?

19 A. These are called impressions. So, we develop the
20 cast from these impressions. So, when the suspect came to
21 the office, this is the material I used to duplicate his
22 mouth. So from these impressions we make models, dental
23 models, or dental casts.

24 Q. Do these pick up high detail?

25 A. Very high detail.

1 MR. JACKSON: State moves to introduce into
2 evidence State's Exhibit 770 and 771.

3 THE COURT: State's Exhibits 770 and 771 are
4 received.

5 Q. I'm now going to show you --

6 THE COURT: Go ahead and proceed.

7 MR. JACKSON: I'm going to proceed.

8 Q. State's Exhibit -- I'm going to show you State's
9 Exhibit 772 and also -- what has been marked for
10 identification purposes State's Exhibit 772 and what has
11 been marked for identification purposes as State's Exhibit
12 773. Do you recognize what each one of those items are?

13 A. I do. So, these are the casts that were made or the
14 models that were made of Jonathan Richardson's mouth using
15 the impressions that I took that were just shown to you.
16 This would be a model of his upper jaw, you can see the roof
17 of his mouth.

18 Q. Let me go through the process of getting it
19 introduced and then you can --

20 A. I'm sorry.

21 Q. Did you utilize these in your examination?

22 A. I did.

23 MR. JACKSON: Your Honor, at this time State moves
24 to introduce into evidence State's Exhibit 772 and 773.

25 THE COURT: Distinguish between those two for me

1 again.

2 Q. Doctor, with regards to State's Exhibit 772 is this
3 the -- what impression is that or what cast is that?

4 A. Your Honor, 772 is the lower model, the lower cast.
5 And 773 is the upper cast.

6 THE COURT: Thank you. State's Exhibit 772 and
7 773 are received.

8 Q. Now you can take them out and show the jurors.

9 A. So, this is -- this is a model, a very accurate model
10 of the suspect's upper jaw.

11 Q. That was 773 for the record.

12 A. And this would be 772?

13 Q. Yes.

14 A. This is the model of the suspect's lower jaw.

15 Q. Do you have multiple of those made, multiple copies
16 made?

17 A. I had about three sets made in case I broke one, in
18 case the courts lost one. So, I have three - one that is
19 now admitted into evidence, one that I hold, and one that I
20 use as a working model.

21 Q. I'm now going to show you what I have marked for
22 identification purposes as State's Exhibit 774. Do you
23 recognize what that is?

24 A. This is a working model that I -- this is one of my
25 working models of Jonathan Richardson's lower arch. And

1 you'll -- I do recognize it, yes. And it is what I just
2 said it is, but I have removed many of the teeth.

3 Q. And did that assist you in conducting your
4 examination?

5 A. It did.

6 Q. Why do you remove the teeth?

7 A. Because I'm trying -- I removed the molars because as
8 we discussed, bite mark evidence usually involves only the
9 six anterior teeth, the six front teeth. And this enabled
10 me then to use just the six front teeth in comparing the
11 suspect's teeth to the victim's bite marks.

12 MR. JACKSON: The State's moving to introduce into
13 evidence State's Exhibit 774 if I haven't already done that.

14 THE COURT: Would you be able to use that to
15 illustrate your testimony of your work in this case?

16 THE WITNESS: I would, Your Honor.

17 THE COURT: State's Exhibit 774 is received.

18 Q. We'll get back to this in a second. With regards to
19 the defendant's casts, were you able to determine whether
20 or not the defendant possessed unique dental
21 characteristics?

22 MR. BROUN: Objection.

23 THE COURT: Overruled.

24 A. In every point of comparison that I used the
25 suspect's teeth have such unique individual characteristics

1 in comparing the dental models to the bite marks on Teghan
2 Skiba's body, specifically the ones of high evidentiary
3 value, I was unable in any way to exclude the suspect from
4 those bites.

5 MR. BROUN: Objection.

6 THE COURT: Overruled.

7 MR. BROUN: I'd like to be heard.

8 THE COURT: All right. Members of the jury, we're
9 going to take a break at this time. During your recess, of
10 course, please continue to abide by my instructions concerning
11 your conduct when you're not in the courtroom. We're going to
12 stay in session for a few minutes while I take up an issue.
13 So, I'm going to give you a break until 11:20 by the clock on
14 the wall. If you would at that time just reassemble in your
15 jury room and I'll send for you. Wear your badges, leave your
16 notes and other materials in your seats.

17 Everybody remain seated while the jurors are
18 excused.

19 (Jury out 11:04:28.)

20 THE COURT: Outside of the jury's presence, yes,
21 sir, Mr. Broun, the basis for the objection.

22 MR. BROUN: The basis for the objection is, first
23 of all, the reasons that we stated back in the Harnett County
24 hearing. But I would like to add, too, that based on Doctor
25 Barbaro's testimony today he talked about -- and this will be

1 for this and for further opinions. I want to make sure it's
2 clear. He talked about that bite mark evidence was more
3 appropriate to exclude suspects than to include them. That's
4 part of it. Second of all, he talked about how it's not as
5 reliable as other forms of science such as DNA. I believe he
6 said fingerprints.

7 Given those added factors, we'd like to include
8 that as the basis of our objection as well as everything else
9 that we argued and submitted briefs. And this is, of course,
10 based on 702, 403, and the constitutional amendments
11 previously cited.

12 THE COURT: Would you like to be heard?

13 MR. JACKSON: I don't think it's necessary.

14 THE COURT: Objection overruled. Obviously,
15 you're free to explore those issues on cross and that they may
16 certainly go to issues of credibility and the weight of the
17 evidence.

18 You've introduced, Mr. Jackson, State's Exhibit
19 774, which is, if I understand correctly, his working model of
20 some of the defendant's lower teeth, those basically in front
21 as I understand it. Is there going to be an Exhibit 775, a
22 similar working model of his upper teeth?

23 MR. JACKSON: No, I don't think so. I don't think
24 there was one that was pared -- the upper model that was pared
25 down to that extent.

1 THE COURT: Just wanted to make sure that you
2 didn't start using it if you hadn't introduced it.

3 MR. JACKSON: Yes.

4 THE COURT: Anything for the State?

5 MR. BUTLER: Judge, just for logistical purposes,
6 it appears this witness will probably take most of the
7 morning.

8 THE COURT: Looks like it.

9 MR. BUTLER: I'll have Agent Admire here to be
10 ready at 2:00 if that's satisfactory to the Court.

11 THE COURT: All right. Anything else for the
12 State?

13 MR. JACKSON: No, Your Honor.

14 THE COURT: For the defendant?

15 MR. BROUN: No, sir.

16 THE COURT: Be in recess until 11:20, Sheriff.

17 (Recess 11:06:30.)

18 THE COURT: All right, it looks like everyone's in
19 place. State ready?

20 MR. JACKSON: Yes, sir.

21 THE COURT: Defense ready?

22 MR. BROUN: Yes, sir.

23 THE COURT: Let's bring the jurors back in.

24 (Jury in 11:26:47.)

25 THE COURT: Doctor Barbaro, if you'd step back up,

1 please. The witness remains with the State.

2 MR. JACKSON: May I approach the witness?

3 THE COURT: Yes, sir.

4 BY MR. JACKSON:

5 Q. Doctor, I'm going to first show you -- I'm going to
6 put these here. This is State's Exhibit 773 and State's
7 Exhibit 772. They've already been introduced into evidence,
8 but I'm going to show you a box in which they came. Do you
9 recognize the box that has been marked for identification
10 purposes as State's Exhibit 720?

11 A. I do.

12 Q. And what is that, is that a dental services box?

13 A. It's just a -- it's a box that we use to send cases
14 back and forth to a laboratory, a dental laboratory. It's a
15 box that was big enough to hold this evidence. It was not
16 -- that laboratory was not involved in this case.

17 Q. So, it's just a box. And when you did -- was State's
18 Exhibit 773 and State's Exhibit 772 originally contained
19 within this box when you handed it to me and I handed it to
20 the detective in this case?

21 A. For protective reasons it was.

22 MR. JACKSON: State would move to introduce into
23 evidence State's Exhibit 720, the box in which 773 and 772
24 were delivered.

25 THE COURT: State's Exhibit 720 is received.

1 Q. Now, I'm also going to show you what has been marked
2 for identification purposes as State's Exhibit 775, and I'd
3 ask you to talk a little bit about the defendant's unique
4 dental characteristics and whether or not you were able to
5 determine whether he had unique dental characteristics that
6 you might then compare with the unique dental
7 characteristics that may have been left in the bite marks on
8 Teghan's body. Did he have unique dental characteristics?

9 A. He had multiple unique characteristics.

10 Q. And I'm going to show you what has been marked for
11 identification purposes State's Exhibit 775. Do you
12 recognize what that is?

13 A. This is just a report that I came up with after
14 examining Jonathan Richardson. I just put this report
15 together. Basically, it's a summary of what I found when
16 the detective brought Jonathan Richardson to the office and
17 I made my initial dental analysis of his teeth.

18 Q. And what were -- can you talk to the jurors about
19 some of the unique dental characteristics that you -- just
20 verbally from there. I'm sorry. Would State's Exhibit 775
21 -- were those your documentation of the unique
22 characteristics from the defendant's teeth?

23 A. Yes.

24 MR. JACKSON: State moves to introduce into
25 evidence State's Exhibit 775.

1 THE COURT: Received.

2 Q. And you can use that from memory or however, but I
3 would like for you to describe for the jurors the unique
4 dental characteristics that you found with regards to the
5 defendant's teeth.

6 A. Just to put things into context, I want to say this
7 first. So, just as we talked about when I look at a bite
8 mark, I look for what -- what the suspect or the defendant's
9 teeth would have to look like. When I look at a suspect's
10 teeth, I start to look for individual characteristics that
11 may make his bite different from the bite that maybe
12 somebody with perfectly aligned teeth would have.

13 And so the first thing that I will tell you is
14 Jonathan came to the office and his teeth were remarkably
15 clean. He had no holes in his mouth, no fractured teeth at
16 all, very good hygiene, no bad breath. Everything looked good
17 as far as the initial examination went.

18 Then I started to take photographs of his teeth,
19 and we already discussed how we took the models of his teeth.
20 And now I start looking for individual characteristics. So,
21 we discussed earlier about class characteristics, adult versus
22 child, and those kinds of things. So, now I'm looking at
23 Jonathan's teeth and I'm trying to figure out what's different
24 about his teeth.

25 I saw that he had two very nice central incisors.

1 Those would be the two teeth in the middle of your upper arch
2 right below your nose. And I noticed that the right central,
3 and I can't demonstrate it here, but I noticed that his right
4 central underneath his right nose, that right central was
5 longer than the tooth next to it. So, tooth number eight was
6 longer than tooth number nine. That's significant for a
7 forensic odontologist.

8 I noticed that tooth number nine was shorter than
9 tooth number eight, but it stuck out further than the other
10 tooth. Again, that would mean that it would leave a mark a
11 little bit out of line with the other central incisor.

12 I went to the two upper side teeth and I noticed
13 on his two upper side teeth that unlike this model, which all
14 of those teeth are in alignment, his upper right side tooth,
15 which is a lateral incisor, tooth number seven and his upper
16 left side tooth, which is tooth number ten, were pushed up.
17 They weren't in alignment. So, what would that mean? When
18 somebody with a tooth that was out of plane or out of
19 alignment with the other two teeth bites, they would not leave
20 a mark as deep as the teeth that were on the same plane. So,
21 I noticed that about those two teeth.

22 Another very significant point was his lower
23 teeth. His two lower central incisors, we talked about number
24 24 and number 25, were rotated inward. So, instead of his
25 teeth being perfectly aligned like that, his teeth pointed in.

1 So, if you went from the lower midline and you were able to
2 take your finger and push against those two front teeth, his
3 teeth, instead of being in perfect alignment, were pushed in
4 towards his tongue.

5 Q. Is there a term for that? Is that a cant?

6 A. It's a rotation, you know. So we call it -- we call
7 it a mesiolingual rotation. Mesio is middle, lingual is
8 tongue. So, we have a middle or mesiolingual rotation. It
9 means that those two front teeth are both canted or rotated
10 towards the tongue. Very significant, very individual.

11 His cuspids were pointy as all cuspids at least
12 start out to be but not extremely pointy. Those are the most
13 significant individual characteristics. Again, we talked
14 about width of incisal edges, so I measured his teeth for
15 width and those dimensions there.

16 Q. And with regards to the like -- do you also use the
17 diameter of someone's --

18 A. So, we look at radius as well. So, somebody who has
19 a really narrow arch would leave a mark that's different
20 than somebody who has a really broad arch. So, think about
21 a radius. I don't know, you know, if you just think about
22 if you'd take a coffee cup and lay it down on a piece of
23 paper and you took a pencil and went around it, that would
24 be the radius of that specific coffee cup.

25 And if you took a juice cup or a juice glass and

1 laid it on the same piece of paper and draw a line around
2 that, that radius typically of a small juice cup would be
3 smaller than the radius of your larger coffee cup for example.
4 So, we call that radius or arc.

5 Someone with a narrow jaw would have a smaller
6 radius than someone with a larger jaw. And we also can
7 measure the distance of the point from eye tooth to eye tooth
8 and that'll give us a sense of width. So, somebody who has a
9 narrow arch, the point to point distance would be shorter or
10 smaller than someone who had a wider arch and that distance
11 would be greater.

12 So, again, the significance there would be a child
13 would have a smaller arch. So, if we measured from point to
14 point, that would be smaller. And when we look at the upper
15 -- when we look at an adult arch, that point to point
16 difference would be larger. Usually around 21 years, say in
17 an adult 32 millimeters as an adult and as little as 22 to 25
18 millimeters in a child. So, we look at distance from point to
19 point, but we also look at radius. Does the radius compare
20 with the suspect's teeth and the bite marks left.

21 Q. And there was evidence earlier that the defendant
22 claimed that a child named Skyler about five years old bit
23 -- as his explanation of the bite marks. Did you form an
24 opinion as to whether or not the bite marks that were left,
25 the various bite marks that were left on Teghan Skiba's body

1 were they adult bite marks or were they from a child?

2 A. For all of the class characteristics and individual
3 characteristics that I saw on Teghan's body they were left
4 by an adult. I base that -- that opinion is based on the
5 width and size of the teeth, the distance from cuspid to
6 cuspid, those pointy teeth that we just talked about, and
7 the fact that there were no spaces in between the teeth.

8 Children have spaces in between their teeth,
9 they're called primate spaces. So, those are class
10 characteristics. The bite mark left in this individual
11 situation in my opinion, never having seen Skyler, but in my
12 opinion these were adult bite marks.

13 Q. So, you had the photographs of the bite marks, you'd
14 seen the bite marks on Teghan's body, you took impressions
15 of bite marks and you now have the defendant's --
16 memorialized the defendant's dental characteristics. You
17 talked earlier about one of the things you're trying to do
18 is to exclude someone. Can you tell the jurors whether or
19 not you were able to exclude the defendant as the person who
20 made the bite marks on Teghan?

21 MR. BROUN: Objection for reasons previously
22 stated.

23 THE COURT: Objection overruled. Go ahead.

24 A. Because there were so many different bite marks on
25 the body and so many good bite marks of high evidentiary

1 value, I had a lot to work with. In each and every case I
2 kept going back -- painstakingly, I kept going back to the
3 models of the suspect and to the impressions made on that
4 victim trying -- as I stated in my earlier testimony trying
5 to exclude the suspect from having made those bite marks.
6 And in every point of comparison I could not exclude him.
7 Everything matched up point to point.

8 MR. BROUN: Objection.

9 THE COURT: Overruled.

10 Q. Did you form an opinion, Doctor, as to whether or not
11 the defendant's unique dental characteristics were
12 consistent with or inconsistent with the bite marks that
13 were left on Teghan Skiba's body?

14 MR. BROUN: Objection for reasons previously
15 stated.

16 THE COURT: Overruled.

17 A. Because of the individual characteristics of the
18 suspect's teeth, his bite, but specifically his teeth which
19 left the bite, and the bite marks that I found, there were
20 too many points that lined up perfectly for me to exclude
21 him. And so, therefore, I found that the marks left by the
22 defendant's teeth and the bite marks on Teghan Skiba's body
23 were consistent one to the other.

24 Q. And were they consistent at every point of
25 comparison?

1 A. At every point of comparison the central incisors
2 matched upper and lower, the radiuses matched, the rotations
3 on the lower teeth matched, the fact that seven and ten were
4 out of plane, meaning they were raised up out of the jaw a
5 little bit, that was also evident in the bite mark. And in
6 a couple of the bite marks I was actually able to see the
7 bicuspid teeth.

8 So, we talked about a bite mark of high
9 evidentiary value having six upper teeth and then six lower
10 teeth and there were some bite marks here that also had
11 impressions or -- impressions of his first bicuspid teeth.
12 That's pretty rare.

13 Q. With regards to your career as a forensic
14 odontologist, have you ever had another case in which the
15 bite mark evidence that you were able to obtain from the
16 victim's body was of such high quantity and quality?

17 MR. BROUN: Objection for reasons previously
18 stated.

19 THE COURT: Overruled.

20 A. In my earlier testimony I stated that I had never
21 seen so many bite marks on any human being in my life. And
22 because there was so many bite marks, it gave me a lot of
23 bites to use and these were of extreme -- there were many
24 bite marks that were of extreme high evidentiary value. So,
25 I had something to work with in many -- in many instances

1 here.

2 And I will also opine that there were other bite
3 marks on the body that were oval patterned injuries but they
4 didn't have the dental detail that I needed to use. But there
5 were so many bite marks there that were available to me for
6 analysis that that didn't hurt the case in any way.

7 Q. And were the defendant's unique dental
8 characteristics consistent with the bite marks on Teghan at
9 every point that you analyzed?

10 MR. BROUN: Objection for reasons previously
11 stated.

12 THE COURT: Overruled.

13 A. So, the bite marks from Jonathan Richardson's dental
14 molds or the unique individual characteristics from
15 Jonathan's dental molds which were a duplication of his
16 teeth matched at every possibility to the bite marks that I
17 used for analysis off of Teghan's body.

18 Q. I am now going to show you, if you'll look at your
19 monitor, I'm going to show you what has been marked for
20 identification purposes as State's Exhibit 763 which is a
21 series of five photographs and labeled -- labeled under the
22 folder photograph taken by Doctor Barbaro. The first one is
23 DSC underscore 011. The second one is 17, the third one is
24 21, the fourth one is listed as 29, and then the last one is
25 listed as 35. Do you recognize those five photographs?

1 A. These are photographs I personally took at UNC PICU
2 of Teghan Skiba.

3 Q. And would these photographs help to illustrate your
4 testimony as to what you observed and your findings in this
5 case?

6 A. It would certainly help me show the jurors how I
7 analyze bite mark evidence and how I use them to compare the
8 bite marks to the teeth of Jonathan Richardson.

9 Q. So, it would help illustrate your testimony?

10 A. Yes, sir.

11 MR. JACKSON: State moves to introduce into evidence
12 State's Exhibit 763, a series of five photographs that I
13 previously identified with their digital name.

14 MR. BROUN: I object for reasons previously
15 stated.

16 THE COURT: Does each of the five photographs
17 fairly and accurately depict a bite mark on Teghan as it
18 appeared to you at the time you observed her?

19 THE WITNESS: It does, Your Honor.

20 THE COURT: Objection overruled. State's Exhibit
21 763 is received for illustrative purposes.

22 MR. JACKSON: I'd ask permission for the witness
23 to step down to illustrate his testimony.

24 THE COURT: He may step down and approach the
25 monitor.

1 Q. There are two pointers. I'm going to ask you to
2 stand over at this area and be mindful of the jurors so you
3 don't step in front of them. Stand where I'm standing right
4 here. First of all, when you arrived at UNC Hospital with
5 the first picture that you took, did you try to take a
6 picture of Teghan as you saw her there in the hospital?

7 A. I did.

8 Q. Is that what she looked like?

9 A. That's what she looked like.

10 MR. BROUN: Objection for reasons previously
11 stated.

12 THE COURT: Overruled.

13 A. So, whenever I'm called into a hospital room to
14 analyze a bite mark victim, I always take an overview
15 photograph. It lets me -- it gives me a reference point
16 later on to determine where the bite marks were positioned
17 on the body. It also gives me a reference point as to the
18 -- just the overall condition of the victim.

19 And so when I'm analyzing different bite marks, I
20 can go back to something like this and try to figure out what
21 picture, what one to one picture I'm looking at, especially in
22 cases where there are so many bite marks and so many multiple
23 bite marks here. I sometimes have to remember where I got
24 that even though I might say left chest for example, there's
25 multiple bite marks on her left chest. So, this gives me a

1 reference point to come back to.

2 THE COURT: Doctor, what digital image number is
3 that for the record?

4 MS. DOYLE: It's DSC underscore 0011.

5 THE COURT: Thank you, Ms. Doyle.

6 Q. So, this is -- we'll call this photograph 11 of
7 State's Exhibit 763. Can you just show where the different
8 -- this doesn't show her whole body but the areas where bite
9 marks were found?

10 A. Sure. So, we talked about patterned injuries and I'm
11 looking really for patterned injuries of high evidentiary
12 value. This is an excellent one right here - left chest.
13 Nipples are way up here. There's another one that you can't
14 see on this photograph right here, but this is the area
15 where I took the impression off of Teghan's body of the
16 bite.

17 But, you know, anything that you see that has that
18 elliptical appearance draws my attention immediately to the
19 possibility that was a bite mark. And these fit all the class
20 characteristics of a bite mark. So, we're looking at round or
21 oval patterned marks and in this particular case most of all
22 of these patterned wounds had tooth impressions or tooth
23 indentations on them.

24 Q. You bit yourself earlier, is that bite mark still
25 there?

1 A. It's gone.

2 Q. And the bite marks that you saw, what classes were
3 they?

4 A. We talked about classification one through five,
5 classification 1 being like a hickey and classification 5
6 being an avulsion. My bite mark was a Class 2 and I will
7 tell you my muscle's sore from biting that muscle. But the
8 indentations are gone and the appearance of a bite mark is
9 gone. So, that's two. We know it's not a two.

10 So, the bite marks that you see here are of the
11 Northwestern University Dental School Classification System
12 three or above. So, this is at least a three because you can
13 see the bruising that occurred and in reality there's actual
14 tear through the skin and then you can see this tear through
15 here. So, that's -- that's a severe Class 3 or a Class 4

16 A Class 4 we talked about was a tearing bite mark
17 and a Class 5 would be an avulsion bite mark. You may not be
18 able to see that in this picture, but Teghan Skiba's right
19 nipple was bitten and torn off her body. So, this would have
20 been a Class 5 Class 3, Class 4. But, you know, here's a
21 Class 3 here, a Class 3 here. Here's probably a two even
22 though it's bruised, there are no indentations or tear through
23 the skin here. But you can see a lot of patterned injuries
24 throughout. There's one on the arm there. I'm out of focus a
25 little bit here. There's patterned injuries all over the

1 body.

2 Q. And can you talk to the jurors about the amount of
3 force that would be necessary to cause these five and four
4 and even three class bite marks?

5 A. There are no gradation systems that I know of, pounds
6 per square inch that it takes to cause any of these bite
7 marks. I went to one course where the model was used where
8 we used vice grips with teeth on them and we used pigs,
9 pigskin, to study bite mark evidence. So, we would actually
10 use a certain amount of force to bite the pigskin that would
11 leave an indentation.

12 So, they think that pigskin oftentimes is as close
13 a model to human skin as possible. So, some -- some forensic
14 bite mark courses use the pigskin as a model to duplicate
15 human skin. But I can't answer the question that Mr. Jackson
16 poses, how much force does it take. But I will tell you that
17 I hurt myself when I bit and my muscle is sore just to touch
18 my muscle. So, that was a much pain as I wanted to inflict
19 upon myself and it's gone.

20 To do a Class 3 and 4 bite and certainly a Class 5
21 bite, all I can tell you is I don't know what the pounds per
22 square inch was, but it was a horrendous amount of force to do
23 that type of damage to Teghan's body and to her skin. You
24 rarely see avulsion injuries in any homicide of any kind.
25 Most avulsion bite mark injuries are caused by animals - bears

1 and dogs.

2 MR. BROUN: Objection.

3 THE COURT: Overruled.

4 A. Bears and dogs are trying, for the most part, to kill
5 their victim. So, they're tearing and using their teeth as
6 their tool or weapon to tear or maim their victim. So, you
7 don't really run into a lot of bite mark evidence in
8 homicide cases where there are avulsion injuries. But when
9 they are present, it shows the worst possible form of bite
10 mark evidence that can be demonstrated to a victim, one of
11 tremendous pain.

12 The other thing that you have to know about is
13 bite mark evidence in adolescents and above, they say is used
14 strictly for punishment. So, sometimes in little children --

15 MR. BROUN: Objection, beyond his scope of
16 expertise.

17 THE COURT: Sustained. Move on to your next
18 question.

19 Q. What I'm going to do now is I'm going to move to the
20 next photograph of State's Exhibit 763 and this is for the
21 record --

22 MS. DOYLE: 0017.

23 Q. 0017 and tell me if you need me to flip it or rotate
24 it in any way. But can you use this exhibit to illustrate
25 your testimony with some of the things that you were talking

1 about earlier?

2 A. So --

3 Q. Do you want me to flip it?

4 A. We can leave it there. So, this is a patterned
5 injury. We saw this on the previous screen. It was on her
6 lower left torso a little bit further below her nipple line.
7 So, you can see the scabbing here. So that would move it
8 into at least a Class 3. There's some tearing here, so it
9 would really move it into a Class 4. So, you have puncture
10 of the skin and you have tearing of the skin. So, we would
11 probably call this a three or a four.

12 But if I can orient you, these are the upper teeth
13 and these are the lower teeth. So, if you could be oriented
14 to the skin here, he's biting with his head facing down. So,
15 his head is oriented down, his chin would be up here.

16 So, I can see the width of teeth is consistent
17 with an adult bite mark. But now the pattern is a closed oval
18 here which is also consistent of the class characteristic of a
19 human bite mark. So, I know it's a human bite mark and by
20 looking at the size of the teeth I know it's an adult, a human
21 adult bite mark.

22 Now I'm starting to look at certain things here
23 and what I see is this is tooth number eight and tooth number
24 nine. And those two teeth are oriented in the same place.
25 So, if you recall, tooth number eight is under the right nose

1 and tooth number nine is under the left nose. But if you look
2 here, you'll see that these marks are different.

3 Now, a significant amount of force was placed to
4 record all of these teeth. So, he's latched onto the skin for
5 a significant amount of time. It just wasn't a quick little
6 thing. He's there for a while to record that information.
7 But because this bite mark is a little bit different than
8 that, it makes me think that there's something different about
9 this tooth when compared to that one. They're side by side.
10 So, they're giving the same amount of force. And so, I'm
11 going to start to think about why is it different.

12 When I go to Jonathan's dental models, I notice
13 that his number eight, that upper right central incisor, is
14 longer than number nine. So, if we exert the same amount of
15 pressure on an object and one tooth is longer than the other,
16 it's going to penetrate deeper than the tooth next to it. So,
17 that's significant right there. This tooth you can see has
18 penetrated deeper. Except for maybe that one little corner
19 right there, this tooth has penetrated deeper and thus has
20 left a deeper mark in the bite.

21 what I also notice if you look right here, there's
22 no tooth here or here and that is the position of Jonathan
23 Richardson's upper left and right lateral incisors. We've
24 already demonstrated in the individual points of comparison
25 that those teeth sat up a little bit higher than the two

1 central incisors did. So, when the same amount of force was
2 presented to the victim's skins, those teeth would not impress
3 the skin as well defined or as deeply as the central incisors
4 did.

5 Here you're starting to pick up the corners of the
6 eye teeth. Those are the canines or the cuspids. The other
7 thing I noticed on Jonathan's models was tooth number nine
8 sticks out just a -- it's not as long but it does stick out
9 just a little bit further than tooth number eight. And that's
10 why you see this deeper mark on that side so that when he's
11 catching that tooth, because that tooth sticks out just a
12 little bit farther, it's very consistent with the mark that
13 I'm seeing right there.

14 There's other things going on in this picture that
15 I'll just show you. These are tooth marks, too. So you see
16 an indentation there and there's other indentations here.
17 Those indentations are left by the same teeth, but because --
18 and probably at the exact same time. But because tooth biting
19 not necessarily is just biting and holding on, he could be
20 biting multiple times at the same -- in the same location.
21 So, we call that a bite on top of a bite or a double bite.

22 In this particular case there's a double bite
23 going on. This may be this cuspid tooth here, I don't know
24 that for sure. But it is a tooth mark and it's being overlaid
25 in the same -- in the same proximity of this bite mark here.

1 So, whenever you see double bites, double bites are caused by
2 maybe he didn't get the hold or, you know, the suspect didn't
3 get the hold that he wanted the first time and had to move his
4 mouth to get a better grasp the second time. So, you'll see
5 double bites all the time in homicides or any kind of assault.

6 Let's go to the lower arch. So, his head is
7 pointing down. These are where his nose would be. This is
8 where his chin would be. And the thing that's readily
9 apparent to me is the mesiolingual inclination of those two
10 teeth on this specific thing.

11 Q. Now, what does that mesio inclination, is that what
12 you said?

13 A. The mesiolingual inclination. So, if you look at the
14 radius, if you could just draw an imaginary line about the
15 radius, those two teeth sit in compared to the teeth on
16 either side of them. So, these are the lower -- the lower
17 central incisors and instead of being evenly positioned
18 these two teeth are pointing in. And I see -- I see that
19 here. If I put my ruler through that incisal edge and
20 through that incisal edge, if I did it -- and I'm sorry
21 because I think I'm going to block somebody out here.

22 Q. Be careful of the cord.

23 A. If I do this and hold this -- this like this, if you
24 could hold that, and this like that, you could see, if I'm
25 on line with the incisal edges, that instead of having that,

1 I have that. It just is another -- it's another individual
2 characteristic that does not allow me to exclude Jonathan
3 from making this bite.

4 Q. The characteristics that you -- unique
5 characteristics that you saw that were consistent with the
6 defendant's teeth and the bite marks, was that consistent
7 throughout all of the bite marks that you saw?

8 A. Through all of the bite marks of high evidentiary
9 value.

10 Q. This is -- the next photograph.

11 MS. DOYLE: State's Exhibit 763, it is 0021.

12 Q. 0021, what are we looking at here? would that help
13 to illustrate your testimony?

14 A. Sure. This is a flip now, so another -- it's another
15 bite and the great thing about this bite is it's a great
16 pattern. It's a closed oval which means, you know, we have
17 the teeth from all six upper and all six lower.

18 Here you can see other teeth marks throughout this
19 same location. So, you have again evidence of a bite here but
20 you also have evidence of partial bites throughout this
21 picture. So, that means he's attacking the victim multiple
22 times here, not just one time.

23 So, we're looking again for upper central
24 incisors. You can see we talked about number eight and number
25 nine. So, this would be number eight, that's the upper right

1 central incisor, that its width is consistent with the incisal
2 edge width of a human adult. You can see the mark that would
3 be left by a longer incisal edge.

4 Now, these two different -- these bites are
5 totally different one from the other. But, again, they have
6 all of the unique individual characteristics that Jonathan
7 has. And if you look down here, you can see the lower incisal
8 edges. And this V on this particular bite is more
9 demonstrable than it was on the other.

10 You have to understand that the sheen that you see
11 on the skin is some sort of protective ointment that they were
12 trying to place on her skin to prevent infection and to treat
13 some of the wounds that were infected and it kind of
14 interferes a little bit with the photography with the
15 flash. But I'm seeing eight and nine up here and I'm seeing
16 24 and 25 here which have that mesiolingual cant. So, instead
17 of being on plane here in that same radius, those two teeth
18 are diverting inward which makes -- and the other individual
19 characteristics here are radius. So, I can take his model and
20 one to one photos of this bite mark and overlay the two, one
21 to the other, and they match consistently.

22 Q. Did you do that?

23 A. I did.

24 Q. And you had mentioned that some of the bite marks
25 were infected. Were the bite marks that you saw, did you

1 form an opinion as to whether or not they were at different
2 stages of healing?

3 A. In my opinion they were in different stages of
4 healing because, you know, you can see some that were much
5 fresher than others which would indicate that they were made
6 at different times.

7 The other thing that you have to understand is
8 this examination was done as I mentioned earlier 35, 36 hours
9 later than when she was first admitted through Johnston
10 Memorial.

11 Q. And for the bite marks that you saw, were they
12 consistent with being made within a ten-day time frame?

13 A. These were made -- these are much fresher than ten
14 days prior.

15 Q. within. I'm talking about within, like within a few
16 -- three or four.

17 A. Yeah, absolutely. Yeah.

18 Q. What are we looking at -- for the record this is --

19 MS. DOYLE: State's Exhibit 763, this is 0029.

20 A. You're looking at another bite mark and this is --
21 we're illustrating this bite mark because it's different
22 from the others where there is movement taking place in this
23 bite. What has happened here is he's grabbed the skin down
24 here. Here's number 24, number 25. You can see that cant
25 right there that orients you to where the midline is.

1 So, here's the midline through. So, this would be
2 his chin. There's the two lower central incisors that cant
3 inward and these are his upper -- these are his upper incisors
4 eight and nine.

5 what is going on here and what makes this a little
6 bit different is it's the recording of a dynamic bite. He's
7 grabbing on the skin with his lower arch and he's scraping the
8 upper teeth across the skin. So, he's not just biting, he's
9 biting and scraping. This is the -- just the trail of his
10 upper teeth cutting through the skin. That's blood obviously
11 and you can see where the tissue has been -- the outer layer
12 called the cutaneous tissue has been removed.

13 So, he's biting and holding on with his lower jaw
14 and he's grabbing pretty hard, but then he's pulling through.
15 So, initial, you know, like initial contact wherever you see
16 the deeper marks, you know, he's really holding on down here.
17 You can see where he's perforated through the tissue here,
18 here. Throughout the lower jaw he's really holding on hard
19 with the lower jaw and with the upper jaw he's pulling through
20 the skin. He's scraping through that tissue.

21 Q. The unique characteristics of the defendant's teeth,
22 did you find that in this bite as well?

23 A. Yeah. You know, obviously it's an adult because of
24 the width of the central incisors, eight to nine
25 millimeters. And, you know, again one of the most unique

1 characteristics of Jonathan Richardson's mouth and his teeth
2 are those lower incisors where I can see the inclination of
3 those lower anterior teeth.

4 Q. Now, the next photograph I'm going to show you you
5 had mentioned earlier -- I think you pointed to her face and
6 you said you thought that might be a two. I'm going to ask
7 you and for the record this is --

8 MS. DOYLE: State's Exhibit 763, this is 0035.

9 Q. What are we seeing here?

10 MR. BROUN: Objection for reasons previously
11 stated.

12 THE COURT: Objection overruled.

13 A. This is just a very unique bite mark. Because of the
14 --

15 Q. It looked like molars. Are those molars?

16 A. They're not. So, if you look, this is Teghan's
17 mouth. This is a bandage up over her head there. But the
18 thing that makes this bite so unique and it's a very, very
19 rare bite is the suspect held on and sucked in. And so what
20 you're seeing -- can I use that yellow model, please? I
21 mean the pink model up here by the tub.

22 Q. Oh, yeah.

23 A. What you're seeing -- can you notice, jurors, can you
24 see the outlines of teeth here? I don't know if you can
25 see. So, here's a tooth, here's a tooth, here's a tooth,

1 there's a tooth. This is the outline. This is an outline
2 of the lower incisors here. You can just see -- you can see
3 the biting edge here and then the next two the teeth. These
4 teeth are bigger than those teeth, so this is the lower arch
5 and this is the upper arch.

6 so, he's biting her cheek and holding on, sucking
7 on right there. And what makes this so different and you
8 don't see it often is that that impression that you see left
9 in the skin is an impression of the back sides of those teeth.
10 So, when he latches onto her skin, he's biting with so much
11 force and so much suction that it's pulling the tissue up in
12 between his teeth and it's impressing the back sides.

13 so, we're not just seeing the incisal edges as we
14 do in every other bite. In this specific bite there's a
15 sucking motion that's pulling the tissue into the mouth and
16 recording the back sides of the teeth. Very rare.

17 Q. why is that rare? what kind of force is necessary?

18 A. There's a lot of force, but there's also a lot of
19 intention. So, it's he's grasping onto the skin and holding
20 it there for a while. And so one of the things, you know,
21 we said this before, bite marks are some of the most
22 intimate forms of assault of any kind. You know --

23 MR. BROUN: Objection.

24 THE COURT: Sustained.

25 Q. we'll move on. Talk about the mechanism by which

1 this type of mark would be left days after it was --

2 A. It's too hard to specifically tell you days, but it's
3 -- you know, it's been there for a while. Obviously it's
4 still there. There was a considerable amount of force,
5 probably not as painful as those other bites because he
6 didn't break through the skin.

7 But the significance of this bite is he was there
8 for a while. It wasn't just a quick I'm going to grab on and
9 let go. He grabbed on and held on for a while and that's the
10 significance of his intention here. He -- he grabbed and held
11 for long enough that he was able to suck the tissue into his
12 mouth and record the back side of his incisors.

13 Q. And this was -- you saw her and took this photograph
14 36 hours after she --

15 A. She was admitted through Johnston, yeah.

16 Q. -- admitted to the hospital. And I think that is it.
17 Thank you.

18 Now, what I would ask you -- this is State's Exhibit
19 773, State's Exhibit 772, State's Exhibit 774, State's Exhibit
20 768. Also going to show you State's Exhibit 767, State's
21 Exhibit 766, and State's Exhibit 769. Now, of these exhibits
22 that have been introduced into evidence, would they all --
23 would all of these exhibits, the photographs, the impressions,
24 the casts, would they help to illustrate your testimony to the
25 jurors with regards to your conclusions and your analysis

1 regarding the defendant's unique dental characteristics and
2 the bite marks?

3 A. They would.

4 MR. JACKSON: Your Honor, at this time I'd ask
5 permission -- and I'll just let you decide which ones you'll
6 use -- I'd ask permission for the witness to step down and
7 utilize these particular exhibits to illustrate to the jurors
8 his testimony.

9 THE COURT: He may step down.

10 Q. Can I just bring these things --

11 A. Sure, yeah.

12 Q. Tell me which ones you need.

13 A. Let's just take them all.

14 Q. What I'd like for you to do is use the photographs
15 and the impressions -- I want to do the impressions separate
16 from the photographs, if you could, and then we'll go to the
17 photographs. What I'm going to ask you to do is to show --
18 and I want to make sure that each juror has an opportunity
19 to see. So, you may have to do it multiple times. I'll
20 just let you use the ones that you want to use but make sure
21 that you -- that these jurors see exactly what you're
22 showing them, that these jurors see what you're showing,
23 these jurors, and then these jurors over here.

24 A. Jurors, these are photographs I took of Jonathan
25 Richardson's mouth, his teeth specifically. So, if you can

1 see here, you're starting to see what I'm seeing where this
2 is the upper right, upper left. This is tooth number eight
3 and if you'll notice it points a little bit further down.
4 Tooth number seven and tooth number ten are a little higher
5 up.

6 These are those two lower incisors that you can
7 see on this photo are canted in and I can demonstrate that
8 better on the models. But so those are some of the
9 significant things that I'm starting to look at just in these
10 teeth. So, we have an elongated number eight, number nine is
11 shorter but it shows in this particular photo that it sticks
12 out in front of number nine. So, instead of being on plane,
13 it's sticking out towards you just a little bit more. Seven
14 and ten are a little bit shorter. Twenty-four and 25 are
15 crowded and rotated in.

16 Same with you jurors. So, tooth number eight, his
17 upper right central incisor is longer than tooth number nine.
18 Number seven and number ten, those lateral incisors, they're
19 sticking up a little bit higher. This shows you tooth number
20 nine, this one here, is shorter than tooth number eight but it
21 sticks out further. It's sticking out further toward you.
22 And these are those two lower incisors that are rotated --
23 that's rotated in, those lower centrals, 24 and 25.

24 Tooth number eight, upper right central incisor,
25 is longer than tooth number nine. This picture here shows you

1 that tooth number nine sticks further out than tooth number
2 eight does. So, that's significant on some of the analysis.
3 Tooth number seven and tooth number ten you can see the space
4 and they stick up a little bit. And because they stick up a
5 little bit, they don't make as deep a mark, deep as the
6 indentation as the others. And then you can see down here the
7 crowding. And you can see on the photos that things are
8 tilted in, but you can see it on the models better than this
9 photograph.

10 Let me illustrate that with the models now. So,
11 we'll just take the upper models. So, these are the casts
12 that we made from Jonathan Richardson's impression that we
13 took at the office. So, you can see this tooth sticks up
14 higher and that tooth sticks up higher. This tooth sticks
15 down a little bit. That tooth sticks out a little bit more.

16 So, this is that number eight you keep hearing me
17 talk about that's a little bit further down. Tooth number
18 nine is a little shorter and it sticks out of plane a little
19 bit. So, why are we doing this? This is to show you the
20 individual characteristics of Jonathan Richardson's teeth and
21 how I used them to analyze the bites left on Tegan Skiba's
22 body.

23 Tooth number eight is a little bit longer than
24 tooth number nine. Nine sticks out just a little bit further
25 and seven and ten stick up higher. So, on that bite they

1 won't leave as deep an impression.

2 Jonathan Richardson's upper jaw and teeth. Number
3 eight is a little bit longer than tooth number nine. Number
4 nine sticks out just a little bit further. Seven and ten, the
5 lateral incisors, they're smaller and they stick out of plane
6 so they're not going to make as deep a bite as those other
7 teeth would.

8 This is Jonathan's lower jaw. Remember we said on
9 the upper jaw you could see the closed palate but down here is
10 where the tongue would sit. So, we see crowding down here,
11 but it's really demonstrable here where you can see those two
12 lower incisors. And instead of being one plane because of the
13 crowding and stuff they're canted in.

14 So, his lower jaw. Tongue would be here, so he'd
15 be facing you. And these are those two lower incisor teeth
16 that we keep mentioning on the films where they're pointed
17 inwards. So, you have that one central that's canted in, that
18 one central that's canted in rather than flowing evenly from
19 side to side.

20 So, the cuspids, these are those two lower
21 incisors and they're tilted inwards. So, the lower cuspids
22 he's facing you and these are those two teeth that are
23 definitely different from the rest of the teeth of his mouth
24 down here anyway and they cant in. And that certainly is an
25 individual characteristic that differentiates his mouth from

1 somebody else's.

2 This is the impression I took of Teghan's under
3 her left breast. So, this is the white material that we
4 talked about that I used. It's a backing material, it's hard.
5 So, the importance of the hardness is it helps maintain --
6 this impression was taken over three years ago. So, it helps
7 maintain the stability of the impression by having a hard
8 backing because this is rubber otherwise and it would be more
9 flexible.

10 So, I took this impression and I'm going to show
11 the jurors that I didn't have very deep indentations. As
12 we've discussed, this was thirty plus hours later. So, the
13 indentations were no longer as deep, but to my surprise I was
14 still able to record some dental information from that.

15 This was the same -- this was a mold made from the
16 same impression that we made of Jonathan's lower arch, but I
17 cut the teeth off because I'm just trying to -- I'm trying to
18 just utilize just his lower -- in this case there's ten teeth
19 there. But I just want to analyze his lower teeth against the
20 bite that I made.

21 So, imagine that that impression that we just
22 showed of his lower jaw with all the teeth on it this is --
23 this is a duplication of that same mold, but I've cut the back
24 teeth off of it so I can use it to illustrate what I'm about
25 to illustrate.

1 So, the bite was on her body somewhere in this
2 vicinity under her left breast. I took that green impression
3 material, and she's laying down obviously, and I injected that
4 material onto her body and I let it sit there and go through
5 an initial set. I took this white casting material out of a
6 foil bag that sets on contact with air and becomes warm and I
7 put that on top and I held it and let it stay in place until
8 it became hard.

9 The impression material itself sets in about three
10 to four minutes in the mouth. Outside the mouth it sets a
11 little bit longer, but it takes a while for this to set. So,
12 this material was pretty -- pretty -- well, it was very well
13 set by the time I allowed the casting material to set. So, I
14 met the constraints of the material to make sure that the
15 green stuff was set and also the white stuff was set and then
16 I removed it. And as I said, to my surprise, I was able to
17 get some detail.

18 And let me show you what I'm talking about. So,
19 using Jonathan's cast of his lower jaw teeth, I just brought
20 this into play. And if you can see the black marks here,
21 you'll see what happens is these teeth they just line -- they
22 line up very well right there. The radius is the same. So,
23 if you see me slide it into position, the points match up,
24 they're there.

25 If they -- if the radius was different, you might

1 see more of something like that occurring where, you know, the
2 teeth didn't actually come down that line. But in this
3 particular case, I can come in and I can line things up pretty
4 accurately.

5 You can't take this as standalone evidence, but in
6 context of everything then it shows that we have a good match.
7 And I'll show you folks back there. So, this is the bite that
8 I took and this is his lower arch and I'm just sliding these
9 teeth into place. And look at the point right there and look
10 at the point right there and you'll see how that the points
11 just line right up.

12 THE COURT: Doctor, if you would, please step out
13 of the jury box. Thank you.

14 A. So, I'm taking the model and I'm just trying to bring
15 it into play. And the marks line up with what I have. I'm
16 just taking his lower arch and I'm putting on her skin and
17 I'm just sliding it forward to see if I can get things to
18 meet and match at the same time and I do.

19 If they didn't match at the same time, they might
20 be skewed off to the right or left or one tooth may be left
21 behind. And in this particular case when the model comes into
22 play, everything starts to line up at the same time. So, my
23 radius is consistent. I'm just bringing it in until I get
24 everything lined up.

25 So, it's just another tool I use to try to include

1 or exclude a suspect. And in this particular case using this
2 impression and this model in my estimation, things line up
3 well enough to not be able to exclude him in any way. And
4 specifically, I can line up points of teeth and inclinations
5 to be the same.

6 Finally, we have some of those pictures that you
7 saw up there. And what I'll do at least is show you here on
8 what I've done -- basically, the same thing that I just showed
9 you there I've done here. So, I tried to see if the model
10 will match the bite mark photograph. You can look, you can
11 see that everything is within that purview of that parameter.

12 So, I've just taken a picture that you saw there.
13 I've taken this model and I've done the same thing. I just
14 tried to line up point to point. You can see the points and
15 the edges all line up together. You see the same thing,
16 everything's just lining up between the mold of his lower
17 teeth and bite mark.

18 THE COURT: If you would, please keep your voice
19 up.

20 THE WITNESS: Yes, sir, I'm sorry.

21 A. So, as you can see, the mold and the one to one
22 photograph, they match almost perfectly if not perfectly.

23 Q. We were talking about the human skin and maybe
24 somebody that's moving will that affect the impression that
25 is left in the skin? How does that affect it?

1 A. This -- because this is a dynamic bite, meaning
2 things are moving all over the place, will it be exactly the
3 same, will you get it 100 percent perfect indentation at
4 every point of comparison? No, you won't, it's impossible.

5 But as I tried to demonstrate to you just now,
6 things line up so well that it does not exclude the suspect as
7 the inflictor or the perpetrator of the bite and in every
8 point the comparison between mesiolinqual inclinations and the
9 points of the cuspids and even in this case, the bicuspid
10 they match and they're not out of plane.

11 And you can see by rubbing this model on the skin
12 impression and on the photograph that as I go into play and as
13 I lead right into the bite mark, I can -- I can match
14 everything up point to point.

15 THE COURT: Mr. Jackson --

16 Q. Would either the photographs or would either the
17 model of the upper teeth, would it help --

18 THE COURT: Mr. Jackson, do you need him to stand
19 by the jury box anymore?

20 MR. JACKSON: I'm trying to find out.

21 THE WITNESS: No, because the model wasn't cut
22 down. So, I'm happy with that.

23 Q. All right. If you'll return to the stand. Can you
24 talk -- the injuries, the bite mark injuries, that you
25 observed on Teghan Skiba's body, you talked about how the

1 defendant's unique dental characteristics matched. Did
2 those bite marks that you saw, would that inflict pain upon
3 the victim? Can you talk to the jurors about that?

4 A. The pain would be horrible. Can you imagine the pain
5 that you would feel if somebody grabbed on --

6 MR. BROUN: Objection.

7 THE COURT: Sustained.

8 Q. I'm going to ask you not to ask the jurors to imagine
9 themselves, but can you talk based upon your training,
10 education, and, expertise your observations of the injuries,
11 the bite mark injuries that you saw on Teghan, can you talk
12 to the jurors about whether or not that would inflict
13 grievous pain and suffering on Teghan Skiba?

14 MR. BROUN: Objection.

15 THE COURT: Sustained.

16 Q. Can you talk to the jurors about whether or not the
17 bite mark injuries you saw would inflict pain?

18 MR. BROUN: Objection.

19 THE COURT: Overruled.

20 A. Bite mark injuries would inflict a lot of pain
21 especially as you went through the class characteristics.
22 So, to go from a two, which is painful, to a five, which is
23 the tearing off of skin, the pain involved in the tearing
24 off of skin would be excruciating.

25 MR. JACKSON: May I have a moment?

1 THE COURT: You may.

2 MR. JACKSON: Your Honor, those would be my
3 questions.

4 THE COURT: You've got cross. How much cross do
5 you think you have?

6 MR. BROUN: Maybe about 45 minutes.

7 THE COURT: Doctor, you can step down. We'll go
8 to lunch.

9 Members of the jury, we'll take our lunch break at
10 this time. Of course, remember that over the lunch break you
11 should not discuss the case among yourselves or with anybody
12 else. Please don't allow anybody to discuss the case with you
13 or in your presence. Continue to avoid communications with
14 people involved in the case. Please continue to keep your
15 minds open and abide by the other instructions I've given you.

16 while you're at lunch, of course, I would ask you
17 to wear your badges. Leave your materials in your seats.
18 You'll be excused and, of course, the transportation officers
19 will take you to whatever restaurant you're going to today.

20 Jurors are excuse, everybody else remain seated,
21 please. Be back at 2:00.

22 (Jury out 12:27:04.)

23 THE COURT: Out of the absence of the jury,
24 anything for the State?

25 MR. JACKSON: No, Your Honor.

1 THE COURT: Anything for the defendant?

2 MR. BROUN: No, sir.

3 THE COURT: Recess until 2:00, please, Sheriff.

4 (Lunch recess 12:27:22.)

5 THE COURT: The defendant and all counsel are
6 here. Defense ready?

7 MR. BROUN: Yes, sir.

8 THE COURT: The State?

9 MR. JACKSON: Yes, sir.

10 MR. BROUN: Just one quick --

11 THE COURT: Yes, sir. Hold on. Yes, sir, Mr.
12 Broun.

13 MR. BROUN: One of my objections, I just wanted to
14 clarify one time when he was testifying comparing the bite
15 marks to that he'd seen with animals and I objected at that
16 time and it was for all the previous grounds, but also because
17 it was a comparison to the defendant and to members of the
18 animal kingdom as well.

19 THE COURT: All right.

20 MR. BROUN: Just for the record.

21 THE COURT: Okay. And the objection I believe was
22 overruled. To the extent that the objection's being lodged
23 again, it's still overruled. It appeared to me that he was
24 simply comparing a bite mark made by a human to one made by an
25 animal.

1 Everybody ready?

2 MR. BROUN: Yes, sir.

3 THE COURT: Bring the jurors in, please.

4 (Jury in 2:07:4.)

5 THE COURT: Doctor Barbaro, if you'd step back up,
6 please, sir. The witness, of course, remains under oath and
7 now with the defense on cross.

8 CROSS-EXAMINATION by MR. BROUN:

9 Q. Good afternoon, Doctor.

10 A. Good afternoon, sir.

11 Q. You have been involved in forensic dentistry since
12 1984?

13 A. That's correct, sir.

14 Q. And during that time I think you have testified on
15 direct that you've done examinations -- you've been involved
16 in identifying bodies based on dentistry; is that correct?

17 A. That's correct.

18 Q. And you have testified in the past about the presence
19 of bite wounds?

20 A. I have -- I have testified in the past on the
21 presence of bite wounds. I was called into a case and
22 tendered an expert in forensic dentistry in a similar case
23 and did similar analysis. But I testified on that trial to
24 the presence of bite marks and the mechanics of the bite
25 mark injury.

1 Q. In that particular case you talked about -- and that
2 was a case back in, I believe, the 1990s, correct?

3 A. It was.

4 Q. And in that case you had done methodology like you
5 have done here; is that correct?

6 A. Correct, sir.

7 Q. But you didn't offer an opinion in that case as to
8 whether the bite marks matched a particular defendant, did
9 you?

10 A. In that case the reason I did not render an opinion
11 as for that bite mark even though I felt that there was a
12 high degree of consistency with the bite mark made and the
13 defendant, the defendant on his -- his interview, his
14 suspect interview, had admitted to the bite -- to biting the
15 child. He termed it a play bite. So, it was never brought
16 into the court as to whether or not I had -- I had to render
17 him the perpetrator of the bite since the defendant had
18 already said that he did it.

19 Q. So, you never testified as to your findings as to
20 methodology in this case, correct?

21 A. I testified to the fact that there was a bite mark
22 and with a high degree of consistency and certainty I
23 thought that the suspect made the bite mark. The courts did
24 not ask whether or not -- they didn't go down that path with
25 me as an expert. I was tendered as an expert, but I didn't

1 -- I wasn't held to that -- to that exact question in the
2 courts.

3 Q. So, you never testified as to your methodology in
4 that case?

5 A. I did not testify, no, sir.

6 Q. You have never testified as to your methodology
7 before today; is that correct?

8 A. That's correct, sir.

9 Q. Sir, you do not have you boards with the American
10 Society of Forensic Sciences; is that correct?

11 A. I don't have my boards with the American Board of
12 Forensic Odontology. I am boarded through the American
13 Academy of Forensic Examiners, but the premier -- the one --
14 I guess -- the way it works really in the civilian world is
15 forensic dentists work through a medical examiner's office
16 and they work under the supervision of a forensic
17 pathologist.

18 Most medical examiners have to be forensic
19 pathologists in the States. And in the state of North
20 Carolina they're paid -- they're paid employees and they have
21 to sit for the board in order to take that seat.

22 I don't sit for -- I don't -- I am not compensated
23 for this by the State and don't feel that I have to sit for
24 the boards because I'm not employed by the State. So, I have
25 not sat for the boards. I've been doing this for 30 years,

1 but I never sat for those boards.

2 Q. I'm going to ask you some questions about the
3 accuracy of bite mark comparisons. And you said that you
4 are familiar with different studies. You testified to that,
5 correct?

6 A. Yes, sir.

7 Q. And you're aware that there are studies that indicate
8 that when it comes to bite mark comparisons, there is a 63
9 percent error rate, correct?

10 A. There's been a study submitted by one of the past
11 presidents of the American Board of Forensic Odontology that
12 felt that there was -- there was an error rate in bite mark
13 comparisons to a degree of up to 63 percent. I have never
14 seen the study. I don't know -- I can quote -- I could
15 quote the statistics, I don't know anything about the study
16 that was done.

17 The difference that you have to understand when
18 you deal with statistics of that high an error rate is --

19 MR. BROUN: Objection, nonresponsive.

20 THE COURT: Overruled.

21 A. The thing that you have to understand in a situation
22 like that is you have to look at the quality and the
23 quantity and the evidentiary value of the bite marks that
24 you're dealing with. So, in some cases bite marks are a
25 part of the -- part of the investigation and part of the

1 crime scene, but not all bite marks have high evidentiary
2 value. And in those situations, consequently the error rate
3 can go up very high.

4 Just to -- just to expound for a second because it
5 does add credence to -- to my defense of that high value. One
6 is there are some cases that are tried in courts of law where
7 the only evidence that they have is bite marks.

8 MR. BROUN: Objection.

9 THE COURT: Sustained. Next question.

10 Q. Sir, you remember testifying in a hearing in this
11 case?

12 A. Yes, sir.

13 Q. Do you remember that you were asked some questions
14 concerning the error rates?

15 A. I do, sir.

16 MR. BROUN: If I may approach, Your Honor?

17 THE COURT: You may, yes, sir.

18 MR. JACKSON: May I approach to see what he's
19 showing?

20 THE COURT: Do you have a transcript, Mr. Jackson?

21 MR. JACKSON: No, I don't have a hard copy with
22 me.

23 THE COURT: You don't have one at all?

24 MR. JACKSON: It's in a digital format.

25 THE COURT: Sheriff, would you hand this to Mr.

1 Jackson, please, and Mr. Broun can just identify the page
2 number.

3 MR. BROUN: It's page 97.

4 MR. JACKSON: Thank you very much.

5 Q. I am showing you, Doctor, what has been marked for
6 identification purposes as Defendant's Exhibit Number 1, and
7 if I could ask you just to read to yourself from line 11
8 through line 18.

9 A. Do you want me to read it out loud?

10 Q. No, just to yourself to make sure you're familiar
11 with what we're saying.

12 A. Yes, sir.

13 Q. And let me see if -- ask you if this correctly
14 reflects what it says. Question -- and I was questioning
15 you that day.

16 A. Yes, sir.

17 Q. Okay. "Do you know from any test or examination what
18 your error rate is?" "Answer: I know from the literature
19 that the error rate can be as high as 63 percent." And I
20 then said, "Question, how high?" And you said, "Answer:
21 Sixty-three." "Question: It can be as high as 63 percent?"
22 Your answer was "Yes, sir."

23 A. Yes, sir.

24 Q. That means that the study that you're citing
25 indicates then that in 63 percent of the cases dentists who

1 say that there is a match are wrong?

2 A. What it's -- what it's saying is in 63 percent of the
3 cases that were rendered in this study, and like I said I
4 haven't seen this study, that the past president of the
5 American Board of Forensic Odontology said that she found
6 that there was a 63 percent error rate. She found that, but
7 it does -- taken out of context it sounds bad. In context
8 you have to look at the evidence that you're dealing with.

9 Q. And you said that was done by the past president of
10 the society -- I'm sorry, the American Society of
11 Odontologists?

12 A. She was the one that quoted that statistic.

13 Q. I'm going to ask you some questions about the area of
14 proficiency tests. You're aware that in some forensic areas
15 analysts, people who make comparisons, are required to take
16 proficiencies, are you not?

17 A. I am, sir.

18 Q. You're aware that fingerprint analysis have to take
19 such --

20 A. I am not aware of that, but I would presume that
21 would be true.

22 Q. You're aware that DNA analysts have to do that?

23 A. I'm not aware of that, but I could see where that
24 would be true.

25 Q. You have never taken any type of proficiency test to

1 determine how accurate your findings are, correct?

2 A. That's correct. I have never sat for a board. I've
3 been through many, many years of -- of continuing education,
4 but no one has ever given me several bite marks as a test to
5 determine who in fact the suspect was.

6 Q. You've never taken -- no other expert has analyzed
7 any of your conclusions to see how accurate they are, have
8 they?

9 A. No other expert has ever analyzed me. In this
10 situation though with the amount of dental evidence that I
11 had and with the amount of points of comparison that I have
12 been able to match, I still say with a degree of scientific
13 certainty that the points match very closely to those of the
14 defendant.

15 Q. No expert has ever examined whether your work in
16 general is accurate; is that true?

17 A. No. No expert has ever examined me and tested to me
18 see how accurate my findings are.

19 Q. No other expert has ever done anything to determine
20 whether your accuracy is more than 63 percent accuracy rate?

21 A. Suffice it to say, jurors, that I have never been
22 tested by an expert to determine whether or not my analysis
23 is accurate or not. It's scientifically based. I've been
24 to many bite mark courses. I stay current with the
25 literature. Everything I do I do according to the gold

1 standard of dentistry. But I have never been tested by an
2 expert to determine whether my error is 63 percent, 20
3 percent, or 100 percent, never.

4 Q. You never requested any other dentist to review your
5 work in this case, did you?

6 A. Most of the time when I work up a forensic case like
7 this, most every single time that I've worked up a forensic
8 case like this I -- we have not gone to trial. Most of
9 these forensic cases are pled out before --

10 MR. BROUN: Objection.

11 THE COURT: Sustained.

12 A. -- before I ever get involved.

13 THE COURT: Hold on.

14 Q. The question simply is this. You didn't have any
15 other dentist check your work in this case?

16 A. I didn't have any other dentist check my work on this
17 case because I felt with the utmost high degree of certainty
18 that every point matched, every point of the bite mark,
19 every point of comparison to the suspect's mouth. I didn't
20 feel there was enough question there for me to even ask for
21 any help, everything was just so plain to me.

22 Q. You testified that Jonathan's teeth are consistent
23 with the bite marks on Teghan; is that true?

24 A. Yes, sir.

25 Q. You didn't testify as to having developed any type of

1 statistical probability in this case, did you?

2 A. I have no statistical probability only to say over
3 and over again that every point of comparison between the
4 bite mark evidence that I had on Teghan's body and the
5 suspect teeth match.

6 Q. Well, when you talk about statistical probability,
7 let me talk about that a little further. You know that
8 other areas where they talk about consistency or matches
9 such as DNA, they come up with statistical probabilities.

10 A. I've heard that, sir, yes, sir.

11 Q. They might say that there's one in a million that
12 it's not the person or something like that, correct?

13 A. I've heard that, sir.

14 Q. But there is no such statistical probability in this
15 case; is that correct?

16 A. There's no statistical value in any bite mark
17 evidence case. So, what the attorney is suggesting that you
18 may look at DNA evidence and somebody will say there's a one
19 in one trillion chance that this person was the suspect in
20 that case or that nobody else could have done that. One in
21 one trillion, it's like winning the lottery thing.

22 In dentistry there's not -- we don't have -- it's
23 not that hard, in fact, kind of science. I've been doing this
24 for 30 years. I examined thousands and thousands of teeth.
25 And so I know my teeth -- I wish -- I wish there was a

1 statistical value that I could place on this to make it a
2 little bit easier for you.

3 I can tell you that I'm sure there are other
4 people in this world that could have made that bite, but with
5 every point of comparison that I chose and made I could not
6 exclude this suspect.

7 And this kind of evidence is more -- it's not like
8 DNA evidence. It's scientifically based, but it's not DNA.
9 It's not -- it's not fingerprint. It's more like toolmark or
10 footprint or tire mark and that's -- those types of forensic
11 -- that type of forensic evidence is permitted in the courts
12 just like the tooth marks are.

13 MR. BROUN: Objection.

14 THE COURT: Sustained. Ask your next question.

15 Q. So, you said it's not like DNA --

16 A. It's not like DNA.

17 Q. -- it's not like fingerprints?

18 A. No, sir.

19 Q. And you said that you developed it based on the
20 unusual characteristics of Jonathan's teeth, correct?

21 A. I made -- I made my points of comparison based on the
22 unusual characteristics and the unique characteristics of
23 Jonathan's teeth.

24 Q. But you don't have any statistics or percentages
25 about what percentage of the population have those

1 particular characteristics, do you?

2 A. You know, there are no -- there are no studies to
3 indicate -- they've even done -- they've even done tests of
4 identical twins to kind of figure out whether or not
5 identical twins have the same teeth.

6 And that they figured out was that they may have
7 the same DNA in their teeth but individual characteristics,
8 individual diets, individual habits like biting and crunching
9 and grinding and chewing, hard diets, soft diets, all of those
10 things affect the wear and tear of your teeth differently from
11 person to person. And that's what makes every single person's
12 bite unique and different.

13 Q. You don't have any percentages about how any
14 particular teeth --

15 A. There are no statistical values, no percentages, sir.

16 Q. And you testified earlier that the value of the teeth
17 mark comparison was to exclude people, correct?

18 A. What I -- my point in my testimony is that any
19 honorable forensic dentist's first role is to exclude rather
20 than include. So, you work hard -- you work hard to analyze
21 the evidence that you have, both from the suspect and from
22 the victim, and you work hard to see if you can exclude that
23 person. In my -- in my analysis, my dental analysis, I
24 could not exclude Jonathan. Every point seemed to match
25 perfectly. I did not include, you are correct, sir. I tried

1 to exclude.

2 Q. That's supposed to be the primary objective of
3 forensic dentistry?

4 A. In my opinion.

5 Q. The only teeth marks that you compared in this case
6 were Jonathan Richardson's, correct?

7 A. Those were the only teeth marks presented to me, sir.
8 That is correct, sir.

9 Q. But you didn't compare it to anybody else's, any
10 other teeth in this case?

11 A. The way this works, whenever a dentist is involved in
12 a forensic dental evaluation, they look at the victim's bite
13 marks and they look at anybody -- any suspect that is
14 presented to them. So, it wouldn't be within my
15 responsibility or within my purview to take casts of
16 patients that walk into my office at about the same time
17 frame that Jonathan Richardson did to see if any of those
18 people might have made the same bite marks. So, I did not
19 do that, no, sir.

20 Q. So, there were no other teeth marks compared. And
21 you know that in other fields such as DNA they have
22 statewide registries of DNA?

23 A. Yes, sir.

24 Q. Nationwide registries of DNA?

25 A. Yes, sir.

1 Q. Fingerprints, they have statewide registries,
2 correct?

3 A. I mean, I'm not a fingerprint or DNA expert, but I've
4 seen CSI. I know what you're saying.

5 Q. Do you?

6 A. Yes, sir.

7 Q. There is no such statewide comparison for bite marks,
8 is there?

9 A. Not -- not that I know of, no, sir.

10 Q. And no national registry that you know of for bite
11 marks?

12 A. No. They have national registries to help find
13 missing persons, unidentified persons, but they don't use
14 bite mark evidence to do that. They use other forms. So,
15 there is a national registry. We use it -- the FBI has to
16 try to find missing -- to try to do dental matches. But
17 they're doing it based on missing teeth, fillings, those
18 kinds of things, not on bite mark characteristics.

19 Q. You've heard of the concept of blind comparisons as
20 far as tests?

21 A. I have, sir.

22 Q. And that's the idea that blind comparisons are done
23 so there won't be subtle or unconscious bias by the person
24 doing the examinations, correct?

25 A. Yes, sir.

1 Q. And there are no blind comparisons done in this case?

2 A. I did no blind comparison other than look at teeth
3 every day in my office during the last three and a half
4 years and saw that every single person that I saw had
5 different bite marks from one another -- different bite
6 characteristics from one another and certainly different
7 from the ones that Jonathan Richardson presents.

8 Q. When you did the comparison in this case, you knew
9 that the teeth that you were comparing to were Jonathan
10 Richardson's, correct?

11 A. You know, as a true scientist in this kind of a
12 situation I did know. I did know they were Jonathan
13 Richardson's. But I, you know, I'm a man of high ethical
14 standards and I'm not willing to put my -- my own character
15 or my own integrity on the line. If I didn't think that
16 those bite marks were Jonathan Richardson, you wouldn't be
17 hearing me up here making this testimony.

18 So, no, I have no blind comparisons. I didn't
19 interview any other suspect. I didn't take models on any
20 other person because nobody else was presented to me. What I
21 did do, objectively, is compare every point of comparison that
22 I had off of Teghan Skiba's body of high evidentiary value and
23 tried to relate them to Jonathan Richardson's mouth. In no
24 point of comparison could I eliminate Jonathan.

25 And so I am here to testify based on my -- my own

1 integrity. And so that has to stand for itself. I wouldn't
2 be here testifying in front of you if I didn't feel I worked
3 very hard in this case to make the analysis.

4 Q. You testified that you're very familiar with the
5 literature, that you keep up with the literature concerning
6 bite mark identifications.

7 A. I do, sir. That's how I found some of the
8 information that I've shared with you.

9 Q. And you're aware that there's a lot of criticism of
10 bite mark comparisons in the scientific community, aren't
11 you?

12 A. There has been a lot of -- there's been a lot of
13 issue over the last 15 years especially. Through the '80s
14 there were a lot of bite mark classes given and a lot of
15 literature -- a lot of textbooks written and stuff like
16 that. I brought one of those textbooks with me today.

17 The problem that bite mark experts got into was
18 their ego. They felt that they were going to make a square
19 peg fit in a round hole and that's not the case. And that's
20 why you can't let bite mark evidence stand itself alone. You
21 have to -- you have to look at the big picture here folks.
22 I'm not looking --

23 MR. BROUN: Objection.

24 THE COURT: Sustained.

25 Q. And are you familiar with the National Academies of

1 Science report that came out -- forensics that came out in
2 2009?

3 A. Could you repeat that for me? I am familiar but not
4 -- could you please repeat it so I know what I'm answering?

5 Q. Sure, I'm sorry. You're familiar with the National
6 Academies of Science report on forensic sciences which came
7 out in 2009?

8 A. I've read so many reports that I don't know what
9 you're specifying here.

10 Q. It's the one done --

11 A. I did read it. I just -- I've read so many reports
12 that I don't remember what that is addressing. I'm sorry.

13 MR. BROUN: If I may approach, Your Honor?

14 THE COURT: Yes, sir.

15 MR. BROUN: If I may approach?

16 THE COURT: Yes.

17 Q. Sir, I'm showing you what's been marked for
18 identification purposes as Defendant's Exhibit Number 2.
19 Seeing this document does it refresh your memory of what I
20 was talking about?

21 A. Is this the same document that you had shown me once
22 before?

23 Q. Yes, sir.

24 A. Okay.

25 Q. would you look at page 172?

1 A. Can I refer to that?

2 Q. You may.

3 A. Can I have a second just to read it?

4 Q. Sure.

5 A. Are you sure it's 172, sir?

6 MR. BROUN: If I may have one moment?

7 THE COURT: You may, yes.

8 A. I found it, 173.

9 Q. I'm sorry.

10 A. Thank you, sir. I've read and I'm re-familiar with
11 this document.

12 Q. And so, you are familiar then with that document?

13 A. I am, sir.

14 Q. And that it discusses some of the problems with bite
15 mark analysis, correct?

16 A. Yes, sir.

17 Q. And there is criticism of it about the belief that
18 bite marks in the skin can change over time, correct?

19 A. Yes, sir.

20 Q. And you agree that that bite mark can change over
21 time?

22 A. Absolutely.

23 Q. And the NSA report expressed concerns because bite
24 marks can be distorted by the elasticity of the skin?

25 A. It can be, yes.

1 Q. And you agree they can be distorted by the elasticity
2 of the skin?

3 A. Remember we discussed when we were using toolmark
4 demonstrations before that the tissue is not hard -- hard
5 wax, hard plastic. It does have an elastic modality to it
6 and depending upon where the suspect bites the victim the
7 distortion can be increased. We discussed earlier this
8 morning that if you were to bite somebody on the bicep, for
9 example, and the bicep was flexed, when the bicep was
10 relaxed there'd be a huge amount of distortion.

11 Distortion changes depending the magnified --
12 depending upon where the bite mark is made. Many of the bite
13 marks made in this particular situation were on flat thin
14 tissue. And so, the attorney had said that and the reports
15 indicate that there is a high degree -- or can be a high
16 degree of distortion in bite marks and bite marks tend to
17 change over time. I'm not disputing that.

18 But what I am telling you is in this particular
19 case the bite marks that I did examine, the ones of the
20 highest evidentiary value, were on her chest. She was a
21 pretty thin girl. There was no way for muscle tissue there to
22 contract or to relax. And I feel like in this particular case
23 I wasn't stretching. I showed the jurors this morning how
24 teeth lined up to the bite marks. And I'm not asking for an
25 exact measurement of -- to the tenth degree here, you know.

1 I'm asking for a general match. And we had a general match in
2 the pictures that I showed you and also in the bite mark
3 impression that I made.

4 So, yeah, I do account in my analysis for a little
5 bit of distortion, no question about that. And I think that
6 this paper is well stated in context. In context you have to
7 understand that we all agree to the fact that there is some
8 distortion. If you look at it out of context and say that no
9 bite mark can be examined with any validity whatsoever because
10 there is -- there is distortion, you're taking things out of
11 context.

12 So in context, I think in this case I've proven to
13 the Court that there was a high degree of consistency between
14 the bite mark evidence here comparing the suspect to the
15 victim.

16 Q. And it can also be distorted by swelling, correct?

17 A. It can be. In this particular case the swelling was
18 long past.

19 Q. So, the swelling had already passed?

20 A. Yes. So, when you bite the tissue there is no
21 swelling. Then you have some swelling and then 36 hours
22 later the swelling is gone. So, I was dealing with a
23 swollen environment at the point -- had I gotten to the
24 victim right after the bite marks were made, I might have
25 had a distortion value due to swelling. But when I was

1 involved in the case, there was no distortion due to
2 swelling.

3 Q. There could also be distortion due to healing?

4 A. There absolutely can be distortion due to healing.
5 The other thing you have to remember see, my hand has
6 already healed from when I bit before. And in this
7 particular case the bite marks persisted, we know for 36
8 hours and maybe longer than that. And I'm looking for --
9 I'm looking for the consistency in the radius. I'm looking
10 for the consistency in the position of the bite marks. I'm
11 looking for the consistency in the rotation of those lower
12 incisors.

13 Is there distortion there? Yes. If I lay the
14 models of Mr. Richardson's teeth up against those bite marks,
15 am I going to get an exact duplication? No. I agree that
16 there was some -- there was some distortion there. But in
17 this particular case I was able to show -- I feel I was able
18 to show the Court that there was a high degree of consistency
19 between every point that I matched.

20 Q. As you said, you didn't see Teghan until 35 hours
21 after she was brought to the hospital, correct?

22 A. Thirty-five hours after she was admitted to the first
23 hospital.

24 Q. So, 35 hours after she was admitted to Johnston
25 Memorial Hospital?

1 A. Johnston Memorial, thank you, sir. Yes.

2 Q. And you're aware that the doctors have said that her
3 bite marks there were several days old at that time?

4 A. I would believe that. I would say -- I would like to
5 say that some of the bite marks may have been a day old. I
6 mean, you know, we don't really know. Some of those bite
7 marks, if you've looked at the pictures of the body, those
8 bite marks were not all of the same age, some were fresher
9 than others. So, I don't know exactly when every single
10 bite mark was made.

11 Q. And you never did anything to age the bite marks,
12 that's not your responsibility?

13 A. And nor -- nor is it -- I mean, if you're questioning
14 whether or not bite marks can -- it's difficult -- it's
15 difficult -- the literature reflects it is difficult to age
16 bite marks.

17 Q. The idea behind bite mark comparison basically is
18 that there are unique teeth that leave unique impressions on
19 the skin, correct?

20 A. That's how we make our analysis. We're looking for
21 individual characteristics that lend themselves to a
22 comparison with a suspect. Yes, sir.

23 Q. And in the NAS study it talks about the fact that
24 there are no studies which indicate that they are unique --
25 that teeth are unique, correct?

1 A. The study I think that the attorney is citing
2 reflects even to the point of analyzing the bites between
3 two identical twins. This is not DNA evidence and so we
4 don't have statistical values or any of those kinds of
5 things in bite mark evidence. But they have shown, and it's
6 experiential, that every single person's bite is different
7 based on their own characteristics and their own diets and
8 their wear and tear and those kinds of things.

9 So, I can't -- I can't address the question as
10 statistical values. Do any other people in this world have
11 the same teeth, do any other people in this world have the
12 ability to make the same bite mark? I can't answer that. You
13 know, I'm sure there are.

14 To answer the question, can somebody else make that
15 bite mark in this world? Absolutely. Was anybody else in the
16 world around Teghan to make that bite mark? That's the
17 question.

18 MR. BROUN: Objection.

19 THE COURT: Overruled.

20 Q. There's no -- the question is simple. There are no
21 studies that talk about the fact that there are unique bite
22 marks, correct?

23 A. There are studies to study the uniqueness of bite
24 marks. I don't know if there's any answer to that question.

25 Q. You're not aware of any studies?

1 A. I am not aware of any profound study.

2 Q. And even if the bite marks -- even if people's teeth
3 were unique, in order for this to have value you have to
4 show that the bite -- that the uniqueness of the teeth
5 dented into the skin, correct?

6 A. Because of the distortion value you may not get 100
7 percent uniqueness of the teeth to the uniqueness of the
8 skin. So, we're not looking for a perfect match. Based on
9 what we've already discussed time and again today, there is
10 -- there is a distortion value. We're looking at points of
11 comparison and trying to make that comparison between the
12 suspect's teeth and the victim's teeth. And in here we -- I
13 showed the jurors on a one to one basis how similar those
14 bite marks were to the suspect's teeth.

15 Q. And, again, there are no studies that talked about
16 the ability of the teeth to uniquely create marks to a
17 person's skin?

18 A. I guess there's -- I guess not.

19 Q. And the study that I gave you, you saw that it
20 concluded that the ability to analyze and interpret the
21 scope of extent of distortion of bite mark evidence has not
22 been demonstrated, correct?

23 A. It says here that no populations have been -- no
24 population studies have been conducted. In numerous
25 instances experts diverge widely in their evaluations in the

1 same bite mark evidence which led to the questioning of the
2 value and scientific objectivity of such evidence.

3 And I think we've addressed the Court along --
4 along those lines. I'm not going to sit here and say that in
5 some cases there is -- there is a reason to question the
6 evaluation and testimony of the forensic dentist based on the
7 evidence provided and the evidentiary value of the evidence
8 provided.

9 In this particular case we had not a scant amount
10 of evidence, we had 66 bite marks, maybe 15 or 20 of very high
11 evidentiary value. I wasn't dealing with one little bite mark
12 or one partial bite mark. I was making an analysis based on a
13 multitude of bite marks, not a scant amount of bite marks.
14 And many of those bite marks had indentations. You saw those
15 indentations.

16 You saw the irregularity and the characteristics
17 that were similar on those bite marks -- the similarity
18 between the bite marks made and the bite and the teeth of the
19 suspect. Here, Mr. Jonathan Richardson. So, I think there --
20 I think there's validity to this report but don't take this
21 report out of context. I didn't have one bite mark to look
22 at. I looked at many, many bite marks covering that lady's --
23 that little girl's body, not one.

24 And those bite marks were good bite marks. We had
25 six upper and six lower teeth in many cases. In some cases we

1 had eight upper and eight lower teeth. We weren't dealing
2 with three or four indentations on one -- in one victim with
3 one bite. So, I don't want to take -- I don't want you all to
4 take this study out of context. We have to look at --

5 MR. BROUN: Objection.

6 THE COURT: Sustained.

7 Q. There's nothing in that report that says that bite
8 mark analysis is only unreliable if it only has one bite
9 mark, is there?

10 A. It does not say that. But it does not -- but it
11 doesn't go in the other direction either. No, it doesn't
12 say that. Also in that same paragraph it's discussing hair
13 analysis and document evidence. So, they're throwing a few
14 different things into that summary of the forensic dental
15 opinion.

16 So, they don't even include -- in their summary
17 they don't even -- they include only forensic dental values.
18 They're looking at other questioning things like questioned
19 documents and hair analysis in that summary.

20 MR. BROUN: No more questions.

21 THE COURT: Redirect?

22 MR. JACKSON: No, Your Honor.

23 THE COURT: Thank you very much, Doctor. You can
24 step down.

25 MR. JACKSON: May the doctor be released?

1 MR. BROUN: No objection.

2 THE COURT: He may. Thank you very much. Next
3 witness?

4 MR. BUTLER: We'll recall Lindsey Admire, Your
5 Honor, who previously testified. We suspended her testimony I
6 think on Friday.

7 *****

8 AGENT LINDSEY ADMIRE, being recalled and duly sworn, was
9 examined and testified as follows during DIRECT EXAMINATION
10 by MR. BUTLER:

11 Q. Just to refresh, would you tell the jurors again your
12 name and where you work and what you do where you work?

13 A. Lindsey Admire. I'm with the North Carolina State
14 Crime Laboratory assigned to the trace evidence section. I
15 analyze specifically hair and fiber evidence.

16 Q. Now, in hair evidence and fiber, does that include
17 things like comparison of things like tape or duct tape and
18 stuff like that, different types of tapes?

19 A. Yes. Within our fiber training it encompasses
20 fibers, fabrics, cordage, duct tape, any type of tape
21 actually - electrical tape, packaging tape.

22 Q. How long have you been doing that kind of analysis
23 with the State Crime Lab?

24 A. I've been with the crime lab since 2006. I've been
25 trained in fiber analysis since 2008.

1 Q. And what about -- fiber includes all those different
2 things; is that correct?

3 A. Correct. Hair analysis was my first discipline I was
4 released in. I trained for a year, so I was released in
5 2007.

6 Q. And in this case that you -- already we've gone
7 through some of the evidence that you've examined and we'll
8 go back and I'll show that to you again in a moment, but
9 what type of analysis were you asked to perform in this
10 particular case?

11 A. I was asked to perform a hair analysis and I was also
12 asked to perform duct tape analysis.

13 Q. Now, Ms. Admire, in performing hair analysis, do you
14 assign statistical studies or values to hair analysis?

15 A. No, we do not.

16 Q. When you do tape analysis, do you assign statistical
17 values to that type of analysis?

18 A. No, we do not.

19 Q. Can you tell us why not?

20 A. In hair analysis specifically, you're looking at the
21 characteristics of many hairs. So, for example, if you were
22 to look at my hair, if I look at it under a scope I may have
23 hairs that are not dyed. I may have hairs that are dyed. I
24 may have hairs that are dyed blonde, some are dyed red. And
25 so you have to encompass all the characteristics of that

1 hair. And even along the length of a hair the
2 characteristics can vary. So, no statistical analysis can
3 be applied because there are so many varying
4 characteristics.

5 Q. And in doing your analysis, are there times in which
6 you're able to exclude certain things as being not a match
7 to the known and unknown sample; is that correct?

8 A. Yes, we can call samples not consistent with an
9 individual.

10 Q. And ultimately if you -- if everything at least what
11 you examine matches up, you're able to make a analysis or
12 conclusion that has to do with the matching part of that; is
13 that correct?

14 A. In hair analysis, the highest we can go is consistent
15 with, which means that a hair, an unknown hair, could have
16 originated from an individual, meaning it has the exact same
17 microscopic characteristics. But that does not mean that
18 there may not be anybody who has those characteristics as
19 well, which is why in hair analysis we actually recommend,
20 if I have called a hair similar or consistent with, then we
21 send on for confirmatory testing through DNA analysis.

22 In duct tape analysis, once again I can call it
23 consistent with. The only way I can say that it did or did
24 not come directly from a roll is if a physical match is
25 present, which means that you can physically match one end of

1 an unknown to the roll itself.

2 Q. And in either of those analyses that you're doing,
3 say there's six different areas which you are comparing, if
4 your items that you are looking, your known and unknown
5 sample, are matching in those areas, you continue to go
6 forward, is that correct, as far as in your analysis; is
7 that right?

8 A. Correct. We look at all areas. So, and if we get to
9 a point the macroscopic -- in hair analysis you look at your
10 macroscopic, just what you see with the naked eye, as well
11 as your microscopic characteristics. If we are not able to
12 exclude on any level, then we call it consistent with, which
13 means it either came from that person or someone with the
14 exact same microscopic characteristics.

15 It's the same in duct tape analysis. If we call
16 it consistent with, it means it came from that roll or one
17 that was manufactured with the exact same characteristics.

18 Q. Do you have a statewide registry or national registry
19 for either hair or tape?

20 A. Not that I'm aware of.

21 Q. Any basic way you could really -- that would work
22 with that type of testing?

23 A. No, there were studies done to try and see if a
24 registry could -- for hair could be done. But with all the
25 characteristics, what I may call brown may be to another

1 person a red-brown color. So, even though analysts were
2 able to say that hair could have originated from an
3 individual the way they marked the characteristics
4 themselves were not consistent across the entire board just
5 because we may see color slightly different, we may see
6 sizes slightly different. And if you're not able to line
7 every single characteristic, you can't have a database.

8 Q. Thank you.

9 MR. BUTLER: May I approach the witness, Your
10 Honor?

11 THE COURT: Yes.

12 Q. Agent Admire, I believe this was on Friday. But
13 basically I'm going to put up here State's Exhibit 546, 702,
14 760, 761, 762, 525, 638, 523, 624, 606, 524, 540, and 538.
15 If you'll look at those and see if those the items which you
16 on Friday, when we were talking, you indicated that you had
17 -- were familiar with and that you had either used in or had
18 been part of your analysis as a result of a request from the
19 Johnston County Sheriff's Department.

20 A. Yes, these are the items.

21 Q. Agent Admire, did you do three separate analyses in
22 this case?

23 A. Yes, I did.

24 Q. How did you do -- is it all listed on one report?

25 A. No, it is not.

1 Q. How do you -- how do you differentiate the different
2 reports?

3 A. In the initial analysis I was asked to perform a hair
4 analysis. I did the hair analysis but no hairs were sent
5 for DNA analysis. In the second report I was asked to send
6 any hairs that I called similar or consistent with, that
7 were suitable for DNA analysis, I was asked to remove the
8 roots from those hairs and send them to our forensic biology
9 section for testing. In the third analysis I was asked to
10 perform a duct analysis and compare questioned samples of
11 duct tape to a known roll.

12 Q. And in your -- well, let me ask you in the second
13 analysis that you were asked to perform, did you also prior
14 to forming -- preparing the items for DNA testing, did you
15 actually analyze hairs from two items which you had not
16 examined previously?

17 A. Yes, I did.

18 Q. And that report reflects that; is that correct?

19 A. Yes, it does.

20 Q. Now, the first report you stated the original thing
21 you did, does that -- would that be called the first report
22 when you first produce it?

23 A. Yes, that is our first report.

24 Q. But do you label it as first report?

25 A. No, it does not actually say first report on it.

1 Every report afterwards will say second report, third
2 report, fourth report for as many as we need to release.
3 But the first one does not have first report specifically
4 written on it.

5 Q. So, the report that initially does not have anything
6 on it would be -- would be your first report as far as an
7 area or the place where you would make such a statement.
8 But on the next one, the second report, it would label that
9 as such; is that correct?

10 A. Correct.

11 Q. And then the third or fourth?

12 A. Correct.

13 Q. Now, what happens if you have to make some
14 modifications to your report after you originally produce
15 it? What do you do at the agency?

16 A. After -- if it has already been initially published,
17 any report thereafter will actually say amended report on
18 it. And at the bottom of the report it will state why that
19 report was amended and what within it has changed from the
20 first report.

21 Q. Now, on the first report, not the second or third
22 report, did you in fact produce an amended report, actually
23 not just once but twice on the first report?

24 A. Yes, there are actually two amended reports.

25 Q. Now, in your amended report, the first amended report

1 and then I guess the final that you amended, does it -- can
2 you just tell the jurors just generally what was the
3 amendments that you made in your reports and whether it had
4 anything to do with your conclusions or findings?

5 A. The amendments specially were, when I released the
6 report, I was asked to further analyze evidence. At that
7 time I had already had the disposition stating that the
8 evidence had been returned via first-class mail to the
9 agency. When I was asked to retain those items of evidence,
10 they still were within our laboratory. So, I received the
11 items of evidence back from ECU and I amended my report to
12 state that the items that remained within the laboratory
13 with me and the items that went back to the agency.

14 In the second report when forensic biology removed
15 some items of hair, they called them hair-like material. They
16 got put under an incorrect submission, which means instead of
17 it saying it was submitted on October 24th, it was actually --
18 or on December 4th, it was actually submitted on October 24th.
19 I just moved those items from being under the second
20 submission up to the first one.

21 Q. You said something about -- you used the term ECU,
22 you received it from ECU; is that the university?

23 A. No, it's the evidence control unit that is basically
24 where all evidence comes in to the laboratory and where it
25 leaves the laboratory.

1 Q. And so the amended report that's dated October 18th,
2 2013, is that the final, I guess, report in regards to your
3 first items that you analyzed in this case?

4 A. There are actually two reports that are dated October
5 18th. The final one of the first report actually says
6 amended report. The second one that's dated October 18th
7 says second report.

8 Q. The one that's dated October 18th, 2013, that says
9 amended report, that was the second amended to your first
10 report; is that correct?

11 A. Correct.

12 Q. And other than what you've already testified to,
13 there are no changes as to your findings or your conclusions
14 or what type of examinations you conducted; is that correct?

15 A. That's correct, there were no changes.

16 Q. And your second report wasn't any amendments to that
17 report?

18 A. No, there were not.

19 Q. And what -- what generally were you being asked to do
20 on the second report?

21 A. In the second report there were two items that I was
22 asked to examine - the hair and do a hair analysis. So, I
23 did a hair analysis on two items. And then there were two
24 items I had previously examined for hair that I removed
25 roots from and sent the roots to the forensic biology

1 section for nuclear DNA analysis testing.

2 Q. Now, since we're there, why don't we -- what do you
3 mean by you removed roots for the DNA for nuclear testing?

4 A. Y'all happen to remember if you think of hair as a
5 pencil. When I'm looking at it under the microscope, I'm
6 looking specifically at this eraser end or what we call the
7 root in. For it to be suitable for nuclear DNA analysis
8 there has to be some type of skin tissue attached to it.

9 So, what we're looking for is a root that may be
10 what's in the growth phase. So, when it's removed, those are
11 the hairs that you say ouch because it still has a blood
12 supply, it's still actively growing. That's going to have an
13 elongated look to it, almost looks like an inverted tube sock
14 when you pull it off.

15 You can have roots that are in the catagen, which
16 is a resting phase. It's not actively growing, but it's about
17 to stop growing and a new hair is about to come in and push
18 the old one out. It starts developing almost like a bulb
19 shape to it, but it still has that elongated look. Those are
20 what are called the catagen phase.

21 And then you have your telogen phase, which there
22 are hairs that are naturally ready to be shed, they're ready
23 to come out, a new hair is starting to come in and those may
24 or may not have skin tissue attached. So, if you have a hair
25 in the telogen phase that is naturally shed, it may not be

1 suitable for nuclear DNA analysis unless it has skin attached
2 whereas in the catagen or anagen phase it is suitable.

3 Q. And so the catagen or anagen phase you're looking for
4 the root ball on whatever hairs -- unknown samples that
5 you're dealing with; is that correct?

6 A. Correct. And so what I specifically send to DNA is I
7 will essentially take a razor blade and cut off that
8 section. So, what is remaining on my slide is the remainder
9 of the hair. I have removed the root off and put it in a
10 tube and that gets given an item number within our
11 laboratory and transferred to the forensic biology section
12 for testing.

13 Q. Now, when you cut this off and put it in the tube, is
14 that before you do your analysis as to the comparison of the
15 hairs?

16 A. That is after.

17 MR. BUTLER: May I approach the witness, Your
18 Honor?

19 THE COURT: You may.

20 Q. I show what you what's been -- would be the amended
21 report that's dated October 18, 2013 -- what has been marked
22 as State's Exhibit Number 776, 777, 778. If you'll at those
23 three items and tell us what they are, please.

24 A. State's Exhibit Number 776 is my final first report
25 that was released on October the 18th of 2013 specifically

1 regarding the hair analysis.

2 Q. And does it include the items which were submitted to
3 you, the type of examination, and then the results of your
4 examination and disposition of evidence?

5 A. Yes, it does.

6 Q. And is the amended report that is dated October 18,
7 2013, in the case of State versus Jonathan D. Richardson, is
8 it a fair and accurate copy of the report that you produced?

9 A. Yes, it is.

10 Q. And is it in the same or substantially same condition
11 as it was when you produced it?

12 A. Yes, it is.

13 Q. As to State's Exhibit 777 I think.

14 A. Yes, 777.

15 Q. What is that?

16 A. That is my second report that details also hair
17 analysis as well as sending items of evidence, the roots
18 specifically, for DNA analysis.

19 Q. And what about 778?

20 A. 778 is my third report that I released that details
21 the tape analysis.

22 Q. What's the date on that one?

23 A. November the 20th of 2013.

24 Q. And the second report's date is what?

25 A. October the 18th of 2013.

1 Q. And do both of those reports also include all the
2 items submitted, the type of examination, results of the
3 examination and disposition of the evidence in this case?

4 A. Yes, they do.

5 Q. And does it -- is it in the same or substantially the
6 same condition as it was when you produced that report back
7 in the fall of last year?

8 A. Yes, both State's Exhibit 777 and 778 are in the same
9 condition.

10 Q. Do they fairly and accurately represent the report
11 that you produced; is that correct?

12 A. Yes, they do.

13 MR. BUTLER: Your Honor, move to introduce State's
14 Exhibit 776, 777, and 778 into evidence.

15 THE COURT: State's Exhibits 776, 777, and 778 are
16 received.

17 MR. BUTLER: Your Honor, I have 16 copies for each
18 of the jurors. If we can pass them out individually and then
19 when we go through them, they'll have them.

20 THE COURT: You may publish copies of State's
21 Exhibit 776, 777, and 778 to each juror.

22 Sheriff, can you pass those out, please? Do you
23 need the jurors to look at them now or are you simply going to
24 ask the witness questions regarding those exhibit numbers?

25 MR. BUTLER: I'm probably going to go through her

1 report and I guess they'll just have it.

2 THE COURT: That's fine. Did you make a copy for
3 me, also?

4 MR. BUTLER: I did, but then I needed to use it to
5 introduce it into evidence. I think we can find you one very
6 quickly.

7 THE COURT: I can look at the originals she said.
8 I think she has both copies.

9 MR. BUTLER: Yeah, that's what I was thinking.

10 Q. Ms. Admire, I'm going to draw your attention to the
11 -- I guess it'd be the first report that's 776 and it has
12 amended in the -- I guess near the top left hand corner of
13 the page. Tell us what -- just generally what you did in
14 regards to the items and in particular if there's any --

15 MR. BUTLER: Your Honor, if I may in the interest
16 of saving time, put the TV over here in the corner. I'm going
17 to show some pictures that are related to those items without
18 having to open them up and show them, if I may, while we're
19 talking about it.

20 THE COURT: Are these photographs in evidence?

21 MR. BUTLER: They're already in evidence, yes,
22 sir. These are photographs of some of the evidence that was
23 taken.

24 THE COURT: All right.

25 Q. Ms. Admire, I've got on the -- I don't have it on the

1 screen, but on the screen is going to be State -- a photo of
2 -- State's Exhibit 524, which is a photo of SBI lab number
3 35, which is the Sheriff's Department 23. Now, in looking
4 at that report, item 35 or 36 which are SBI numbers; is that
5 correct?

6 A. Correct. When they come into the laboratory they get
7 their own specific lab number.

8 Q. Those items you did not test in your first report; is
9 that correct?

10 A. No, I did not.

11 Q. And item number three, which is listed down at the --
12 at the top, items under December 4, 2012, your item three,
13 did you test that item?

14 A. Not for hair analysis. It was previously examined by
15 another analyst.

16 Q. Was that Agent Carter who testified previously?

17 A. Yes, Kate Carter.

18 Q. So, you didn't go back through the hair analysis on
19 that -- the analysis of the hairs that were on that tape; is
20 that correct? You did not do that?

21 A. I did not do the hairs that were on that tape.

22 Q. And item number 40-1 that is -- it's listed on the
23 second page of that report, hair-like material collected
24 from boxers. I believe those are the boxers that were
25 previously indicated that they were found on the floor of

1 the defendant's room inside the Creech home. Did you do a
2 testing on that item?

3 A. I did not specifically see the clothing itself.
4 There was some hair that was removed by the analyst in the
5 biology section and the hairs were transferred to me.

6 Q. So, that's when you get it, the item 40-1 is
7 derivative -- what's called derivative item or something
8 like that?

9 A. It's called a sub item, meaning the parent is item
10 number 40. So, it came into the laboratory, which in this
11 case was some boxers. When the biologist opened that item
12 of evidence, some hairs were noted. Those hairs were
13 removed. Because it came from item 40, it became 40-1.

14 Q. And did you do an examination of what you refer to as
15 item number 69, which was State's numbers -- excuse me,
16 Johnston County Sheriff's Department number 97, which is the
17 State's Exhibit Number 624? Did you do an examination of
18 those items?

19 A. Yes, I did.

20 Q. And did you in your first report also do an analysis
21 of what you call SBI number 80, which was Johnston County
22 Sheriff's Department 110-A and State's Exhibit 635, white
23 tape with hair on it?

24 A. Yes.

25 Q. In your first report is that -- are those the initial

1 analysis that you did in regards to this case in your first
2 report?

3 A. Yes, as well as opening up known standards that were
4 collected from both Jonathan Richardson and Teghan Skiba.

5 Q. And those would be items 65, which are State's
6 Exhibit 540, and item 12-1 -- 65 being the victim's --
7 excuse me, the defendant's hair standard and 12-1 being
8 Teghan's hair standard which was 538, State's Exhibit 538;
9 is that right?

10 A. Yes.

11 THE COURT: Mr. Butler, just a moment ago you said
12 State's Exhibit 625. Did you mean Exhibit 638?

13 MR. BUTLER: If it was 80, SBI number 80, it is
14 638. My handwriting's not that good.

15 Q. So, in your initial analysis you analyzed what would
16 be three unknown samples; is that correct?

17 A. Yes.

18 Q. If you would follow along in your report, if you
19 would tell the jury what you did and what the results of
20 your examination were.

21 A. Specifically the first thing I'm going to do is open
22 an item to see if hairs are present. If hairs are present,
23 then I'm going to mount hairs. In this case, because so
24 many hairs were present, I didn't mount every single hair.
25 Macroscopically, if they all looked similar to each other, I

1 took a sampling of five hairs and would mount them and then
2 do a comparison against the victim and suspect's standards.

3 Q. And you said in particular an item -- well, item 41,
4 you obviously did not have to collect it, but you did the
5 examination of one or more hairs in that; is that correct?

6 A. Correct. There were two hairs present in that item.
7 I mounted both hairs and did a microscopic comparison
8 against the victim and suspect standards. That was item
9 number 40-1. So, examination of item number 40-1, which is
10 the hair-like material collected from boxers, revealed the
11 presence of two hairs found to be microscopically with the
12 hair in item number 12-1, known head hair collected from
13 victim. Therefore, the hair in item number 40-1 could have
14 originated from the same source as the hair in item number
15 12-1. One of these hairs had a root that may be suitable
16 for nuclear DNA analysis.

17 Q. So, both hairs though you say were consistent with
18 Teghan's hair sample; is that correct?

19 A. Correct. Both hairs were consistent with the head
20 hair standard from the victim. However, one hair was a
21 fragment, meaning no root was present or there was no root
22 at all on the hair.

23 Q. And did you do anything with the root ball for the
24 hair that you determined to have potential DNA on it or
25 suitable for nuclear DNA analysis?

1 A. In this specific report I did not.

2 Q. What was the next thing you did in your first report?

3 THE COURT: Mr. Butler, I think this is a good
4 place.

5 MR. BUTLER: Okay.

6 THE COURT: Members of the jury, we'll take our
7 afternoon recess at this time. During the recess, of course,
8 please abide by those instructions I've given you concerning
9 your conduct. Leave your materials in your seats, wear your
10 badges. Be back in the jury, please, in about 13 minutes.
11 That'll be 3:30 by the clock on the wall.

12 The jurors are excused.

13 (Jury out 3:16:56.)

14 THE COURT: Anything for the State or the
15 defendant?

16 MR. BUTLER: Only thing I would ask, Judge, is
17 I've got -- my next witness is Mr. Lockamy and he's testified
18 on voir dire. There's nothing involving this case. Is it
19 possible -- is there any objection to him sitting in the
20 courtroom before his testimony? I know he's been sequestered
21 so we've been keeping him outside.

22 MR. BROUN: No objection.

23 THE COURT: All right. Anything else for the
24 State?

25 MR. BUTLER: No, Your Honor.

1 THE COURT: Anything for the defendant?

2 MR. KLINKOSUM: Your Honor, I'm going to request
3 -- I think Mr. Butler is going to make copies of the reports
4 that have been introduced, 776, 777, and 778 --

5 MR. BUTLER: I thought you already had them, but
6 if you --

7 MR. KLINKOSUM: I believe we do. We've got quite
8 a bit of paperwork of Agent Admire. Just to make sure we're
9 all on the same page --

10 MR. BUTLER: We'll make an extra copy. I meant to
11 have them make two extras.

12 MR. KLINKOSUM: That's fine

13 THE COURT: That's fine. Can I get my copy of the
14 transcript of Doctor Barbaro's testimony back? I received
15 mine in electronic format. Be in recess until 3:30.

16 (Recess 3:18:14.)

17 THE COURT: State ready?

18 MR. BUTLER: Yes, sir.

19 THE COURT: And is the defense ready?

20 MR. KLINKOSUM: Yes, sir.

21 THE COURT: Let's bring the jury back in, please.

22 (Jury in 3:34:21.)

23 THE COURT: You may continue.

24 MR. BUTLER: Thank you.

25 BY MR. BUTLER:

1 Q. Ms. Admire, after you removed the root ball from 40-1
2 did you do something with -- make preparation to send it for
3 DNA analysis?

4 A. Yes, that would be the second report. When we remove
5 the root from the hair itself, when I mount hairs on a
6 microscope slide, it's in a glue-like substance. So, what
7 I'm going to do is I'm going to rinse that root to remove
8 the glue. So, I will put it in a chemical called xylene,
9 which just dissolves the glue, and then rinse it in water
10 and then rinse it in methanol and then rinse it in water.
11 Then I put it in a tube and it's sent to DNA.

12 Q. And you've done that with all the root balls that
13 you've cut off to submit for DNA analysis?

14 A. Yes.

15 Q. Now, what was the next thing you did in your
16 examination in the first report?

17 A. The next item I examined was item number 69, which is
18 pieces of brown hair. Examination of item number 69, pieces
19 of brown hair, revealed the presence of a large clump
20 approximately 100-plus hairs. All hairs appeared
21 macroscopically similar to each other and a sampling of five
22 hairs were mounted for comparison purposes.

23 The mounted hairs in item number 69 are found to
24 be microscopically different from the hair in item number 6-5,
25 known head hair standard collected from Jonathan Richardson,

1 and 12-1, known head hair collected from victim. Therefore,
2 the hair in item number 69 could not have originated from the
3 same source as the hair in items number 6-5 or 12-1. Two of
4 the mounted hairs in item number 69 had roots that may be
5 suitable for nuclear DNA analysis.

6 Q. So, you're saying all of the five hairs that you
7 examined which were macroscopically similar to all the other
8 hairs in the large clump of brown hair did not -- could not
9 have originated -- you were able to exclude both Teghan and
10 the defendant; is that correct?

11 A. Correct.

12 Q. What's the next thing you did as part of your
13 analysis?

14 A. I examined item number 80, which is white tape
15 containing hair. Examination of item number 80, white tape
16 containing hair, revealed the presence of several pieces of
17 what appeared to be masking tape with multiple hairs,
18 approximately 30-plus individually adhered to the tape
19 pieces. A sampling of five hairs were mounted for
20 comparison purposes.

21 One of the hairs was found to be microscopically
22 different from the hair in item number 6-5, known head hair
23 standard collected from Jonathan Richardson, and 12-1, known
24 head hair collected from the victim. Therefore, this hair in
25 item number 80 could not have originated from the same source

1 of hair in items number 6-5 or 12-1.

2 The remaining four hairs were found to be
3 microscopically consistent with the hair in item number 12-1,
4 known head hair collected from victim. Therefore, these hairs
5 in item number 80 could have originated from the same source
6 as hair in item 12-1. Two of these hairs had a root that may
7 be suitable to nuclear DNA analysis.

8 Q. So, when you say two of them, two of the four hairs
9 did have a sufficient root ball; is that correct?

10 A. Correct, the other two were fragments or they were
11 telogen and did not have a tag, so it didn't have a skin tag
12 present on the root.

13 Q. And at this point you did not do anything else with
14 the sample other than you were going to send it back at that
15 point; is that correct?

16 A. Correct.

17 Q. What's the next thing that you did?

18 A. Pursuant to a phone conversation I was asked to
19 further examine item number 35, which is laboratory item
20 number 35, duct tape with hair and laboratory item number 36
21 white tape with hair as well as send any hairs that I called
22 similar or consistent that had roots suitable, cut the roots
23 and send them for DNA analysis.

24 Q. And is this the -- was the substance of your second
25 report, what's entitled second report?

1 A. Yes, it is.

2 Q. And that second report is listed up on the top of
3 page one?

4 A. Yes, in the top left hand corner it says "second
5 report."

6 Q. If you would, tell the jury about what you examined
7 and what your results were.

8 A. Examination of item number 35, duct tape --

9 Q. Let me stop you, I apologize. I believe it's been
10 shown that item number -- this is a photograph we're seeing
11 up on the screen which is State's Exhibit 395, showing SBI
12 number 35, which is also the State Exhibit 524. Is this
13 what you examined as part of what you labeled item number
14 35?

15 A. Yes, it is.

16 Q. And if we could see the next picture. This would be
17 photo 396, which is another angle of State's Exhibit 524,
18 the lab number 35. Is that -- is this how you found the
19 item which you labeled State's Exhibit Number 35?

20 A. Yes, it is.

21 Q. Did you also examine what you labeled SBI number 36,
22 the white tape with hair?

23 A. Yes, I did.

24 Q. And that'd be -- I believe that was Johnston County
25 Sheriff's Department item number 24 and it's been listed as

1 State's Exhibit Number 25. If we could see the next
2 photograph which is State's Exhibit Number 395. Is that the
3 white tape -- I apologize 397. Is 397 the item that you
4 gave the number 36 to and you examined?

5 A. Yes.

6 Q. Now, I'll show you State's Exhibit 398 which is
7 another photo of that.

8 A. Yes.

9 Q. Now, are those the two -- well, was there also an
10 item 80 that you marked item 80, which you had previously
11 examined? Did you also have that as part of your analysis
12 in the white tape containing hair as referred to in your
13 first report which is labeled amended report?

14 A. Yes.

15 Q. And did you also examine the 40-1, the hair-like
16 material that was collected from the boxers in the
17 defendant's -- from the defendant's room in the Creech
18 house? Did you also look at that during your analysis of
19 the second report?

20 A. Yes, 40-1 and 80, the roots were removed from those
21 hairs. There was not another actual comparison performed
22 because I'd already done the comparison.

23 Q. So as to 40-1 and 80, you did not do any comparisons
24 but you did determine whether or not there was comparisons
25 as far as what your items -- State's Exhibit 35 -- excuse

1 me, SBI number 35 and 36; is that correct?

2 A. Yes. Because no hair analysis had been done
3 previously, I did the same thing by removing five hairs and
4 mounting them and did my hair comparison.

5 Q. If you'll just go through your -- the second -- I
6 guess it would be on the second page of your report labeled
7 second report. If you would just give the results of your
8 examination of that.

9 A. Examination of item number 35, duct tape with hair,
10 revealed the presence of three sections of gray duct tape
11 with multiple hairs, approximately 30-plus, individually
12 adhered to the tape pieces. All hairs appeared
13 macroscopically similar to each other and a sample of five
14 hairs were mounted for comparison purposes.

15 Four of these hairs were found to be
16 microscopically consistent with the hair in item number 12-1,
17 known head hair collected from victim. Therefore, these hairs
18 in item number 35 could have originated from the same source
19 as the hair in item number 12-1.

20 Q. Let me stop you for a second. You said in the second
21 line you say these hairs, multiple hairs approximately
22 30-plus, individually adhered to the tape pieces. What do
23 you mean by individually adhered to the tape pieces?

24 A. They weren't in a large clump. So, they were placed
25 throughout the tape itself. So, when I was looking at them,

1 you saw them all over the tape, not in just one large clump
2 on the tape.

3 Q. Now, when the tape came to you, I think we're looking
4 at 395 photo, is that the way the tape came to you?

5 A. Yes.

6 Q. So, where were the hairs in this item that is, I
7 think is State's Exhibit -- actual State's Exhibit 524?

8 A. In order to get them off, I had to open the tape.
9 And when you do that, you do it very carefully so as not to
10 break the hairs because I wanted to have whole hairs to do a
11 comparison against. So, I would lightly open the tape and
12 try and remove hairs from within it for comparison.

13 Q. And when you say you opened the tape, you're saying
14 the hairs you're looking to collect aren't just on the
15 outside stuck to the outside of the tape, but you had to go
16 actually -- you separate pieces of tape to get to them?

17 A. Yeah, there was some hairs that you did have to
18 separate tape. There were some hairs that were on the
19 outside. But to get a sampling you had to actually open the
20 tape itself and remove hairs.

21 Q. And is that what you in fact did, removed hairs from
22 inside after you opened up the tape?

23 A. Yes.

24 Q. Continue on with your report, what you did.

25 A. Three of these hairs have roots that may be suitable

1 for nuclear DNA analysis. The roots of these hairs were
2 removed, assigned items number 35-2 through 35-4 and sent
3 for nuclear DNA analysis. The remaining hair mounted for
4 comparison purposes was found to exhibit both similarities
5 and slight differences to the hair in item number 12-1,
6 known head hair standard collected from victim.

7 Accordingly, no conclusion could be reached as to
8 whether or not this hair in item number 35 could have
9 originated from the same source as item number 12-1. This
10 hair had a root that may be suitable for nuclear DNA analysis.
11 The root of this hair was removed, assigned item number 35-1,
12 and sent for nuclear DNA analysis.

13 Q. Now, you don't do the DNA analysis; is that correct?

14 A. No, I do not.

15 Q. So, it would be sent off to somebody to determine
16 what, if any, match could be made based on DNA; is that
17 right?

18 A. Yes. It states within our laboratory it would be
19 sent to the forensic biology section.

20 Q. So, what's the next thing you did as part of your
21 second report?

22 A. Examination of item number 36, white tape with hair
23 --

24 Q. Let me -- is this looking at State's Exhibit 397 and
25 ask you is that the white tape?

1 A. Yes.

2 Q. And did you have to open that tape up also to remove
3 hair?

4 A. Yes.

5 Q. So, some of the hair that you did in your sample were
6 not just stuck on the outside like if you have a piece of
7 tape and you just pulled it, you had to open the tape to get
8 to some of the hairs that you used; is that correct?

9 A. Correct.

10 Q. Go ahead with the results of your examination,
11 please.

12 A. Examination of item number 36, white tape with hair,
13 revealed the presence of one long piece of what appeared to
14 be white masking tape with multiple pieces layered on top of
15 each other, approximately seven. The pieces were all wadded
16 together with multiple hairs, approximately twenty,
17 individually adhered throughout. All hairs appeared
18 macroscopically similar to each other and a sampling of five
19 hairs were mounted for comparison purposes.

20 Four of these hairs were found to be
21 microscopically consistent with the hair in item number 12-1,
22 known head hair standard collected from victim. Therefore,
23 these hairs in item number 36 could have originated from the
24 same source as the hair in item number 12-1.

25 All four of these hairs had roots that may be

1 suitable for nuclear DNA analysis. The roots of these hairs
2 were removed, assigned items 36-1 through 36-3 and 36-5 and
3 sent for nuclear DNA analysis. The remaining hair mounted for
4 comparison was found to exhibit both similarities and slight
5 differences to the hair in item number 12-1, known head hair
6 standard collected from victim.

7 Accordingly, no conclusion could be reached as to
8 whether or not this hair in item number 36 could have
9 originated from the same source as item number 12-1. This
10 hair had a root that may be suitable for nuclear DNA analysis.
11 The root of this hair was removed, assigned item number 36-4,
12 and sent for nuclear DNA analysis.

13 Q. Thank you. What else did you do as part of your
14 analysis in this case?

15 A. Items number 40-1, hair like material collected from
16 boxers, and number 80, white tape containing hair, were not
17 opened as the items were previously analyzed by this
18 analysis. The results of that analysis can be found in the
19 laboratory report dated September 30th, 2013.

20 Q. Let me stop you. That was the original report but
21 was amended so the report that they were looking report was
22 -- amended report October 18th, 2013, is the same results of
23 examination that was in the September 30, 2013, report; is
24 that correct?

25 A. Yes, the results did not change.

1 Q. Go ahead.

2 A. However, pursuant to a phone conversation with ADA
3 Paul Jackson of the Johnston County District Attorney's
4 Office on October 9th, 2013, the roots that may be suitable
5 for nuclear DNA analysis, one hair from slide one in item
6 number 40-1, one hair from slide one in item number 80, and
7 one hair from slide four in item number 80 were requested to
8 be sent for testing.

9 The root from the one hair in item number 40-1 was
10 removed, assigned item number 40-1-1 and sent for nuclear DNA
11 analysis. The roots from the two hairs in item number 80 were
12 removed, assigned items number 80-1 and 80-2 and sent for
13 nuclear DNA analysis.

14 Q. And did you write some other information in your
15 examination?

16 A. Yes. The remaining items were submitted for use as
17 standards. The hairs --

18 Q. What does that mean?

19 A. When we specifically mention -- so I mentioned item
20 number 35, 36, 40-1, and 80 and then all the sub items with
21 the roots I did not specifically mention 6-5 and 12-1, they
22 were submitted for use as standards.

23 Q. That's the known hair samples from the defendant and
24 the victim; is that correct?

25 A. Yes.

1 Q. What else did you say about -- did you have like
2 another statement at the bottom there?

3 A. Yes. The comparison of the microscopic
4 characteristics and hairs does not constitute a basis for
5 absolute personal identification. The probative value of
6 hair comparisons may be affected by the results of DNA
7 analysis.

8 Q. What does that mean in English I guess? What are you
9 saying there?

10 A. It basically means that when I say a hair is
11 consistent or similar to an individual, I am not saying it
12 is that person with absolute certainty. What I'm saying is
13 that the characteristics within the hair look like a known
14 standard. And so, therefore, that hair could have
15 originated from that person or someone with the exact same
16 microscopic characteristics.

17 Q. If you had found differences, that would tell that
18 there was a difference in the hairs either microscopic or
19 macroscopic examinations, then you'd be able to say
20 absolutely those hairs were not from the same person; is
21 that right?

22 A. Based on the standard that is submitted, I can say
23 that those hairs do not look like that individual.

24 Q. And what did you do with the evidence, the items of
25 3-1 -- excuse me, 35-1 through 35-4, 36-1 through 36-5,

1 4-1-1 and 80-1 and 80-2?

2 A. They were transferred to Special Agent Timothy Baize
3 of the forensic biology section on October 17th, 2013 for
4 nuclear DNA analysis.

5 Q. And item 35, if we could go back to the photo, this
6 is State's Exhibit 395, that item which is your item number
7 35, did you retain that item in your custody at that point?

8 A. Yes, I did.

9 Q. What was the purpose of retaining State's Exhibit
10 Number 524, which is displayed in photo number 395, the duct
11 tape that was found in the outbuilding? Why did you keep
12 that?

13 A. To do a duct tape analysis against a known standard
14 that was submitted to the laboratory.

15 Q. Is that your third report?

16 A. Yes.

17 Q. Tell us what you're doing there, please.

18 A. Item number three, pieces of duct tape with hair from
19 scene, was found to be consistent in color, construction,
20 and composition with item number 88, roll of duct tape.
21 Therefore, item number three could have originated from item
22 number 88.

23 Q. Let me take you back for just a second. I apologize.
24 You examined -- what items did you examine and when you get
25 the -- did you have unknown and I guess, for lack of a

1 better word, a known sample to compare with?

2 A. Yes. I have two unknown samples, item number three,
3 pieces of duct tape with hair from scene, and item number
4 35, duct tape with hair. And I had one known sample, item
5 number 88, roll of duct tape.

6 Q. Now, item three, which is State's Exhibit 523, that'd
7 already been analyzed previously by another analyst; is that
8 correct?

9 A. For hair analysis, correct.

10 Q. And the duct tape in State's Exhibit Number 524, SBI
11 number 35, was what you retained to also do the analysis?

12 A. Correct.

13 Q. Now, can you open up -- in front of you is State's
14 Exhibit Number 702, which is your SBI number 88.

15 A. (Witness complies.)

16 Q. What is that?

17 A. This is the roll of duct tape that was submitted for
18 me to analyze and then this was created by me as my samples
19 that I used.

20 Q. That's what you called the SEM samples?

21 A. No. The SEM samples are a separate item.

22 Q. Okay. So, now in State's Exhibit Number 702, if
23 you'll hold that up, which is the Johnston County item
24 number 178, the roll of duct tape that was found in the
25 defendant's truck, is that a brand new roll of duct tape?

1 A. No, it is not.

2 Q. I mean, you're fairly familiar with duct tape as you
3 analyze on this stuff all the time; is that right?

4 A. Correct.

5 Q. Can you look at that and tell us whether it's -- what
6 the percentage approximately of a normal roll is that tape?
7 Is it like almost all there, partially there, or what?

8 A. I don't know how much was used, but I would say this
9 is a partial roll. I don't know if it's 20 percent, 50
10 percent.

11 Q. And what were you asked to do and what did you do as
12 a result of that request in regards to that piece of tape
13 and State's Exhibit Number 524, which is your item number
14 35, and State's Exhibit 523, your item number three?

15 A. I was asked to do a comparison from this known sample
16 to see if the questioned items, item number three or item
17 number 35, could have originated from this. The first thing
18 I'm going to do is -- you see I marked on it, it says cut.
19 I'm going to remove the end because I want to see if there's
20 a physical match. So, I was checking to see if any of the
21 questioned items could physically be placed back to this
22 roll of tape, kind of like a puzzle piece, see if they fit
23 together.

24 If I do not find a physical match, then I will go
25 through and do a full duct tape analysis on the known as well

1 as the two questioned samples.

2 Q. How do you do a duct tape analysis? What are you
3 looking for and compare with that item that's in your hand
4 now, the roll of tape, with these pieces of used tape that
5 were found in the defendant's -- the outbuilding where the
6 defendant was staying with the victim?

7 A. What I'm going to look at -- obviously, you're going
8 to look at the color. You're going to look at the width of
9 the tape. Duct tape itself is comprised of three different
10 components. You have the backing which is, you know, what
11 you normally see the coloring on. You have the adhesive or
12 the sticky part. And between the adhesive and the backing
13 you have a piece of fabric or scrim that is placed in the
14 duct tape.

15 So, I'm going to analyze the backing using what's
16 called infrared analysis and I'm going to look to see what
17 type of material this backing is both on the outside and I'm
18 going to remove the adhesive and the scrim and I'm going to
19 test the inside because sometimes you have multiple layers of
20 plastic that are placed together.

21 Q. When you talk about the scrim, what is the scrim?

22 A. The scrim is the fabric piece. So, if you were to
23 remove this adhesive --

24 MR. BUTLER: May she step down, Your Honor, so she
25 can show it to the jurors?

1 THE COURT: She may.

2 Q. Step down and show us what you're talking about.

3 A. I might be able to show it a little better if I can
4 open this item.

5 Q. You're talking about the plastic -- plastic bag that
6 was contained in State's Exhibit Number 702?

7 A. Yes.

8 Q. Those are the items you cut off the roll of tape, is
9 that correct?

10 A. Correct. So, I got this, it was originally one
11 piece. So, this was attached like that. So, what I did was
12 I cut the sample off so that I didn't -- if there was a
13 physical match, I'm not going to mess with that end. I
14 don't want any of my pulling or anything to distort anything
15 that could be a physical match.

16 Q. That was the end of the tape?

17 A. Yes, this was the end of the tape.

18 Q. When you found it or when it came to you?

19 A. Correct. And then you can see I started doing some
20 of my analysis back here. So, when I say that you have the
21 three components, you can kind of see these fibers that are
22 sticking out. They're woven so you have some that go the
23 length of the tape, some that go the width of the tape. And
24 what this does is this provides strength to the tape.

25 If you've ever had some duct tapes where you have

1 to take scissors to cut them because you cannot tear them,
2 that fabric's really tightly woven. If you have ones that you
3 can tear really easily, it's not very tightly woven.

4 And then you have your adhesive. So, you can see
5 I removed the adhesive off because I wanted to test the
6 backing specifically. I wanted to look at this side and the
7 inside using my instrument.

8 Q. Make sure everybody can see. Give everybody a chance
9 to see it.

10 A. This is where you can see I took off the adhesive
11 itself. When I use my instrument, I can just place this
12 down -- the adhesive directly onto my instrument so I don't
13 have to remove any of the samples.

14 And then so you test your adhesive, you test your
15 backing front and back. I also do what's called a cross
16 section because I want to look to see how thick that backing
17 is. I want to see if there's multiple layers because my
18 instrument may be able to see on this side and what's on this
19 side, but if there's something in the middle, I need to
20 actually take a cut and look at it under a microscope to be
21 able to see.

22 And then with the scrim itself, that fabric piece
23 that's in it, I'm going to look at the fibers that got the
24 length and I'm going to look at fibers that go to the width.
25 And I'm going to do comparison against all of those components

1 of this duct tape back to the questioned samples and see if
2 they all have the same components.

3 If at any point they don't have the same
4 components, then I cannot say the sample could have originated
5 from this known source because there are differences between
6 the two.

7 Q. Are you saying that there's significant enough of a
8 difference between one piece of the same company's duct tape
9 -- I mean, one company makes the duct tape, there can be a
10 difference between two different duct tapes if one person's
11 got one thing of duct tape and another person's got another
12 that looks exactly the same on the outside, the same brand,
13 same everything, you can actually tell a difference from
14 those if they are in fact made at a different time and place
15 or at different --

16 A. There could be differences. Because if you think
17 specifically like -- this is adhesive. There's a whole
18 bunch of different components that get put into a big vat,
19 mixed up, and as the sample is going through processing,
20 they just add the adhesive. Well, if you run out of
21 adhesive halfway through and have to mix up another batch,
22 it's going to have the same components but you may have had
23 something slightly different that becomes present.

24 Or, when you're making this scrim, these fibers,
25 if you run out of fibers, there may be slight differences

1 between the fibers. Or, if you run out of this polyethylene
2 backing, there may be differences as you're doing it.

3 So, what we're doing is we're analyzing not only
4 the look of it, but we're looking at the chemical components
5 of all of these three separate components.

6 Q. So, like if -- let's call it a run if somebody --
7 they had like a -- in a factory they make a run of all these
8 materials or this duct tape and maybe they then switch out
9 the different type of -- they run out of the backing or that
10 adhesive and they mix up another batch of it and do those
11 things, is that going to be -- is that going to register to
12 being different by your analysis?

13 A. There could be differences that are seen.

14 Q. And you could -- you could separate them in those
15 situations; is that correct?

16 A. If there are differences seen, yes.

17 Q. And as far as a physical match between item 35 and 80
18 and item three with 88, the known -- the roll of duct tape,
19 you did not find any physical matches; is that correct?

20 A. I did not find a physical match.

21 Q. Do you do a -- in item number 94, you've got -- refer
22 to SEM samples from items three, 35, and 88. Tell the jury
23 what the SEM samples are and how you produce those.

24 A. This is what's called a --

25 Q. What number is that that you're holding up?

1 A. This is State's Exhibit Number 762, it is laboratory
2 item number 94, and it's SEM samples. What an SEM is is
3 it's a scanning electron microscope. So, it's a microscope
4 that looks at the elemental inorganic components of the
5 material. Do you want me to open this item?

6 Q. Would it aid you in describing it to the jury?

7 A. Yeah. So, what I did when I'm doing my samples --
8 there's a sticky surface that's on this. So, when I made my
9 samples, I'm taking the adhesive and the backing and I'm
10 putting it on here and the instrument's going to look at all
11 of those components that are within them and I can compare
12 the components that are in each of those individual samples.

13 So, this stub has actually been divided into four
14 quadrants and within each quadrant I have samples from the
15 known, the two questioneds, and then in this lower quadrant
16 that looks empty there are more cross sections present so that
17 we could look at the backing to see better is there was
18 another layer -- see how many layers were present of the
19 backing.

20 Q. And once you've done all that, are you able to make a
21 determination of whether you can determine if there is a
22 consistent match or whether you can --

23 A. Yes. Based on all of those analyses I would be able
24 to say if a sample could have originated from the same
25 source. Because there is not a physical match, I cannot say

1 that a sample came directly from there. But with all of
2 those components I can say that they are all consistent with
3 each other. So, these samples either came from that roll or
4 one with the exact same microscopic chemical and optical
5 properties.

6 Q. So, as to item number three, the piece of duct tape
7 with hair from the scene, and the item 35, the duct tape
8 with hair that also came from the outbuilding behind the
9 Creeches' residence, what did you find them to be in
10 relation to item number 88, the roll of duct tape?

11 A. For item number three, pieces of duct tape with hair
12 from scene, was found to be consistent in color,
13 construction, and composition with item number 88, roll of
14 duct tape. Therefore, item number three could have
15 originated from item number 88.

16 Item number 35, duct tape with hair, was found to
17 be consistent in color, construction, and composition with
18 item number 88, roll of duct tape. Therefore, item number 35
19 could have originated from item number 88. No physical
20 matches were found between items number three, 35, or 88.

21 The SEM samples from item numbers three, 35, and
22 88 that were used in the analysis are being return as item
23 number 94, SEM samples from items number three, 35, and 88.

24 Q. Thank you. And just for housekeeping I guess, item
25 40-1, the hair that was recovered and you analyzed from the

1 boxers, is it one of the items -- the item --the 40-1, the
2 actual hair itself, where is that? Can you look at that and
3 see if that's 760, does that include that?

4 A. It should be within item number 760, State's Exhibit
5 761.

6 Q. I think that's already been admitted into evidence,
7 okay.

8 MR. BUTLER: May I have just a moment, Your Honor?

9 THE COURT: Yes.

10 MR. BUTLER: That's all the questions I have at
11 this time.

12 THE COURT: Cross?

13 MR. KLINKOSUM: Thank you, Your Honor.

14 CROSS-EXAMINATION by MR. KLINKOSUM:

15 Q. Good afternoon, Agent Admire.

16 A. Good afternoon.

17 Q. Going to back to when you were testifying, I think it
18 was Friday, you talked about finding hair on clothing and
19 you made -- I think you made the -- or you testified that
20 you would expect to find -- when people live together, you
21 would necessarily expect to find people's hair on each
22 other's clothing?

23 A. Yes. It's not uncommon because you think, you know,
24 you come in and you sit on a couch, you may shed a couple of
25 hairs. Somebody comes behind you, sits in that same spot,

1 they may pick up those hairs on their clothing.

2 Q. Exactly. And people shed also -- including
3 furniture, people shed head on their clothing, correct?

4 A. Yes. Naturally we shed about one hundred head hairs
5 a day.

6 Q. And when people's clothing gets mixed together like
7 either in laundry or just jumbled together, those hairs can
8 transfer from one piece of clothing to another, correct?

9 A. That is a possibility.

10 Q. Just like if they sit on a sofa like you said or a
11 chair where someone shed on it, they might get their hair on
12 the back or their shirt or blouse, correct?

13 A. Correct.

14 Q. Or even on their pants or their shorts, correct?

15 A. Correct.

16 Q. Now, talking about 40-1, hair-like material collected
17 from the boxers, now you are -- when you're doing this
18 analysis you're not necessarily told where this evidence
19 comes from, am I correct about that?

20 A. Based on the description I'm told it came from
21 boxers.

22 Q. Came from boxers. But you don't know where the
23 boxers were located, correct?

24 A. No.

25 Q. Where they were found is what I'm saying.

1 A. No. I would have to look at the SBI-5 to see if
2 there was a location.

3 Q. And so it would not be uncommon -- well, for
4 instance, you were given a head hair standard from Jonathan
5 Richardson, correct?

6 A. Correct.

7 Q. And a head hair standard from Teghan Skiba, correct?

8 A. I was actually given two head hair standards from
9 her, but one of them was not suitable for comparison
10 purposes.

11 Q. You were given what are known as known standards,
12 correct?

13 A. Correct.

14 Q. From both Mr. Richardson and Teghan Skiba, correct?

15 A. Correct.

16 Q. And so, it would not be uncommon for -- if they were
17 living together or in the same house for her hair to be
18 found on some of his articles of clothing, correct?

19 A. Correct.

20 Q. And even for his hair to be found on some of her
21 articles of clothing, correct?

22 A. Correct.

23 Q. Now, talking about the duct tape, you separated the
24 duct tape out and found various hairs, correct?

25 A. Correct.

1 Q. Now, you don't know how those hairs got on the duct
2 tape, do you?

3 A. No.

4 Q. Your analysis can't tell you how the hair got on or
5 in the duct tape, correct?

6 A. No. I can't say how long a hair has been present in
7 a situation or on an item.

8 Q. And you can't tell whether that hair got on the duct
9 tape because it was put on somebody's body and taken off,
10 correct?

11 A. I can determine that a hair was forcibly removed. I
12 don't know if it was forcibly removed by the duct tape
13 itself or if it was forcibly removed previously and then
14 somehow got adhered to the duct tape.

15 Q. Okay. Or if the hair and the duct tape ended up in
16 the trash can together and got mixed together, correct?

17 A. Based on the fact that this was wadded together and
18 I had to undo the sample, it seems that there were hairs in
19 between pieces of tape. So that would seem that that hair
20 got there as it was wrapped somehow.

21 Q. And if, for instance, someone were using that tape on
22 a piece of furniture or carpet or something that had hair on
23 it and they took it up and wrapped it up, that's how the
24 hair could transfer to the duct tape, correct?

25 A. It can, but in this situation you have one long piece

1 of tape that had been wrapped multiple times and then it
2 appeared to have been cut off. Because when I was looking
3 for physical matches, I could physically match ends of one
4 item back together. So, it appeared to be one long piece
5 that had been wrapped.

6 Q. And did you know that they were found -- one of those
7 was found in a trash can?

8 A. No.

9 Q. And as far as the duct tape's concerned, although you
10 found it to be consistent in color, construction, and
11 composition you, couldn't make a physical match from the
12 duct tape to the roll -- the duct tape in evidence, the
13 pieces of duct, to the roll, correct?

14 A. No, I could not physically match the end that was on
15 the roll of duct tape back to any of the questioned items.

16 Q. And in terms of analyzing hair, you put -- in your
17 report you put the qualifying language that indicates the
18 microscopic characteristics of hair don't constitute a basis
19 for absolute personal identification, correct?

20 A. Correct. That is why we recommend that any hairs
21 that are similar or consistent with an individual be sent
22 for nuclear DNA testing because nuclear DNA testing can give
23 you a confirmatory result.

24 Q. That's right. Because DNA from one person to another
25 is different, correct?

1 A. I'm not a DNA expert, so I can't answer that
2 question.

3 Q. Okay. But in any event, you send it to DNA because
4 it can be a more conclusive -- it's a more conclusive type
5 of testing, correct?

6 A. Correct. Because with hair analysis, I'm looking at
7 microscopic characteristics as a whole.

8 MR. KLINKOSUM: Nothing further at this time, Your
9 Honor.

10 THE COURT: Redirect?

11 MR. BUTLER: No, Your Honor.

12 THE COURT: Thank you very much. You may step
13 down.

14 MR. BUTLER: May she be released?

15 MR. KLINKOSUM: No objection.

16 THE COURT: She may. Madam Clerk, let me give you
17 the originals, please, of State's Exhibit 776 through 778.
18 Call your next witness.

19 MR. BUTLER: Andrew Lockamy. Come around, Mr.
20 Lockamy.

21 *****

22 ANDREW LOCKAMY, being first duly sworn, was examined and
23 testified as follows during DIRECT EXAMINATION by

24 MR. BUTLER:

25 Q. State your full name for the Court, please.

1 A. Andrew Ray Lockamy.

2 Q. And, Mr. Lockamy, where do you live, sir, just
3 generally?

4 A. McGee's Crossroads.

5 Q. What kind of work do you do at the present time?

6 A. I tattoo.

7 Q. And you work in a tattoo store or parlor or whatever
8 you call it up in the 40-42 area?

9 A. Yes, sir.

10 Q. How long you been doing that kind of work?

11 A. About three years now.

12 Q. Prior to working at the tattoo parlor, what did you
13 -- what kind of work did you do before that?

14 A. I worked for Carroll Construction. I delivered
15 framing materials for houses.

16 Q. How long did you do that kind of work?

17 A. Maybe four years.

18 Q. When you say you delivered, what do you mean by that
19 exactly?

20 A. The houses we were building wouldn't have enough
21 material so I'd have to go pick up two by fours and treated
22 material and deliver it to the house so they could finish
23 the houses.

24 Q. Did Carroll Construction have difference individuals
25 or more than one site going on at the same time?

1 A. Yes.

2 Q. And were sometimes people working on the exterior
3 houses?

4 A. Yes.

5 Q. Some on the interior houses?

6 A. Yes.

7 Q. Were there also -- were most the groups that worked
8 on the interior, exterior teams or units that worked on
9 these areas?

10 A. Sometimes they had two or three people.

11 Q. Now, did Mr. -- did Carroll Construction also have
12 one or more people who worked during the time you were there
13 that would work on things like decks and stuff like that
14 that would work independently?

15 A. Yes.

16 Q. And would you also supply materials for those people
17 also?

18 A. Yes, I would.

19 Q. As a result of your job, did you pretty much get to
20 meet at least pretty much everybody working for Carroll
21 Construction at the time you were there?

22 A. Yes, and including sheetrock sometimes.

23 Q. Sheetrock, too, okay. Well, let me take you back to
24 sometime I guess, maybe it was in 2009, did you meet -- did
25 you meet a guy by the name of Jonathan Richardson as a part

1 of your employment?

2 A. Yes, I did.

3 Q. Do you see that person in the courtroom here today?

4 A. Yes, sir.

5 Q. Can you point out to the Court, please?

6 A. (Witness complies.)

7 Q. Are you referring to in sort of the white with blue
8 stripes shirt at that other table?

9 A. Yes.

10 MR. BUTLER: And, Your Honor, I'd ask the record
11 to reflect that he pointed to the defendant.

12 THE COURT: The record may so reflect.

13 Q. Now, Mr. Lockamy, as part of your working at Carroll
14 Construction, did you, I guess, get to know the defendant,
15 Jonathan Richardson?

16 A. Yes, I did.

17 Q. I mean, now, when you were doing that, how would you
18 describe initially y'all's relationship?

19 A. Initially, I would just take stuff to him and talk to
20 him for a little bit. And then the longer he worked here
21 and I worked there kind of grew a little bit of a
22 friendship.

23 Q. At some point did you and he begin talking about
24 going on a fishing trip?

25 A. Yes.

1 Q. Now, did you fish a lot or is this something --

2 A. At the time I didn't fish a whole lot. I wanted to
3 get more into it and I enjoyed, so I just was going.

4 Q. And so who sort of initiated or planned the trip that
5 y'all went on?

6 A. I can't recall exactly. We just decided to do it.

7 Q. Did you have a boat?

8 A. No.

9 Q. Who had the boat?

10 A. Jonathan's father, I believe.

11 Q. And did Jonathan bring the boat with y'all?

12 A. Yes.

13 Q. Now, in talking about this did you sort of -- do you
14 remember when you went fishing on this fishing trip with the
15 defendant?

16 A. Yes.

17 Q. Now, during the time of this fishing trip or right
18 around the time of this fishing trip, did something else
19 happen in regards to Carroll Construction that sort of
20 affected Carroll Construction during that time?

21 A. Yes. The boss, Tony Carroll, his father, Glen
22 Carroll, passed away.

23 Q. And do you recall going to his, what some people call
24 wake or the visitation on the night -- the night before his
25 funeral?

1 A. Yes.

2 Q. And do you recall whether that was a -- what night of
3 the week that was?

4 A. It was a Saturday night.

5 Q. Now, I'm going to ask you a little bit more about
6 this trip. Do you recall -- do you recall what day of the
7 week -- let me strike that. Did you go -- when did you
8 leave to go on the fishing trip?

9 A. We left after the wake on the 3rd.

10 Q. The 3rd of what?

11 A. July.

12 Q. What year was this?

13 A. 2010.

14 Q. And how do you know that it was the 3rd of July of
15 2010?

16 A. Because after we left the wake, I went back to my
17 house and he picked me up and we left to go from there.

18 Q. How do you know -- how do you remember now this was
19 the 3rd of July of 2010?

20 A. I went back and found pictures on my Facebook of us
21 at Roanoke Rapids on the 4th.

22 Q. And were you talked to sometime back somewhere after
23 all this happened in mid July of 2010, did the police talk
24 to you about this situation?

25 A. Yes.

1 Q. And did you talk to them about when it was that you
2 went on that occasion also?

3 A. Yes, I did.

4 Q. And the -- you got a --

5 MR. BUTLER: May I approach the witness, Your
6 Honor?

7 THE COURT: Yes.

8 Q. I just want to show you -- this is State's Exhibit
9 Number 61. It's a calendar that's been listed as being for
10 latter part of June and the first part of July of 2010 and
11 ask you if you can -- so what -- can you point to which day
12 it was being -- this is being July 1, 2, 3 which date did
13 you say that y'all left to go on this trip?

14 A. Saturday, the 3rd.

15 Q. And did you go fishing on what day?

16 A. We went fishing on the 4th.

17 Q. And did you -- when you were on this fishing trip,
18 did you go -- take any pictures of anything?

19 A. Yes.

20 Q. Tell us a little bit about the trip. Where did y'all
21 stay when you got up to -- have you ever been up that way?

22 A. It was the first time for me.

23 Q. Tell us a little bit about it.

24 A. I can't recall where we stayed at. It was a little
25 hotel, motel, whichever one's outdoors. We stayed there and

1 then the next morning we woke up and went fishing very
2 early.

3 Q. Very early. You mean like daybreak type early?

4 A. Maybe about an hour after.

5 Q. And whose vehicle did y'all take to this area?

6 A. Jonathan's.

7 Q. And what was the name of the area that you went to,
8 if you know?

9 A. Weldon, North Carolina.

10 Q. Weldon, okay. And when you got to the river, you
11 said you -- did you notice anything unusual about the river
12 where you put in at?

13 A. Just there was some rapids right --

14 Q. What do you mean rapids?

15 A. Where the water goes over the rocks and creates
16 rapids.

17 Q. Like a little waterfall or something?

18 A. Yeah, kind of.

19 Q. Is it navigable, the area -- that rapid areas, was it
20 navigable with the boat?

21 A. Maybe in some areas but for the most part, no.

22 Q. Did you take a picture of that at that time?

23 A. Yes.

24 Q. Why did you take a picture of it?

25 A. I thought it was pretty and I wanted to take a

1 picture.

2 Q. what did you take the picture with?

3 A. My cell phone at the time.

4 Q. And were you on one of these things -- some of these
5 social sites that people get on?

6 A. Yes.

7 Q. what site were you on back in July of 2010?

8 A. Facebook.

9 Q. And what, if anything, did you do with the photograph
10 that you took on your camera or the camera on your phone of
11 the rapids?

12 A. I posted to Facebook.

13 Q. And did you post it the same day or later?

14 A. The same day.

15 Q. How much after -- how long after you probably took
16 the picture did you post it?

17 A. Thirty seconds to a minute.

18 Q. So, after you got to the rapids, put in at the water,
19 I assume y'all went downstream from the rapids instead of
20 upstream?

21 A. Yes, sir.

22 Q. Did you go fishing?

23 A. Yes.

24 Q. Now, who else went other than you and the defendant?

25 A. No one else.

1 Q. Tell us a little bit -- did you catch anything?

2 A. Yes.

3 Q. What did you catch? Just tell us about that, please.

4 A. I don't know what kind of fish it was exactly. It
5 was a large white fish, maybe two, two and a half foot long.

6 Q. Two and half feet long?

7 A. Maybe.

8 Q. And did you catch just the one or more than one?

9 A. I only remember catching one.

10 Q. Did y'all take some pictures of that?

11 A. Yes.

12 Q. I'm going to show you on the monitor, what would be
13 State's Exhibit Number -- you're looking on the screen.
14 We're going to put it up here on the TV over here if we can.
15 While we're trying to figure that out, let me just talk to
16 you about it. The photo that's in the picture in front of
17 you is that a picture -- who's that a picture of?

18 A. Me.

19 Q. What are you doing in that picture?

20 A. Holding up a fish.

21 Q. Who took it?

22 A. Jonathan.

23 Q. And is this while you were on the fishing -- on the
24 morning of the fishing trip of July 4th of 2010?

25 A. Yes.

1 Q. Now, Mr. Lockamy, was this picture taken before or
2 after you took the pictures of the rapids?

3 A. After.

4 Q. You looked pretty happy there.

5 A. Yeah.

6 THE COURT: What exhibit number is that?

7 MR. BUTLER: This would be State's Exhibit Number

8 --

9 MR. JACKSON: This is the image that was contained
10 in the disk that was introduced into evidence by Special Agent
11 Mike Smith.

12 MR. BUTLER: And it's 1454 is the number at the
13 top.

14 MR. JACKSON: The number is, yes, 1454.

15 THE COURT: I don't know what exhibit number it
16 was.

17 Q. Now, and then we're going to look at the next
18 photograph which is 14 --

19 THE COURT: Wait a minute, what exhibit number?

20 MR. JACKSON: It was contained on -- Your Honor,
21 may it please the Court. Your Honor, this image is contained
22 on what has been introduced into evidence as State's Exhibit
23 602 which was Special Agent Mike Smith's files that he
24 recovered from the Kodak and that is the exhibit number and
25 this is the image file 1454 that is contained within that

1 exhibit.

2 THE COURT: Thank you very much.

3 Q. And if we can go to the next one which would be 1455.

4 THE COURT: Same exhibit number?

5 MR. BUTLER: Same exhibit number.

6 MR. JACKSON: Same exhibit number.

7 Q. Who do we see in this photograph?

8 A. Jonathan.

9 Q. What's he -- has he also caught a fish, too, or is
10 that the same fish you'd caught earlier?

11 A. That was one he had caught.

12 Q. And what's he holding the fish up with?

13 A. It looks like a knife.

14 Q. Is the knife in the fish?

15 A. That's what it looks like.

16 Q. And was that also the morning of the 4th of July of
17 2010?

18 A. Yes.

19 Q. Thank you. I'm going to show you real quick if I can
20 the pictures of your -- of your trip to Roanoke Rapids.
21 This is State's Exhibit Number 735, which is a series of
22 four photographs that are on a disk that we handed up --
23 previously provided to the Clerk. Can you see that on your
24 screen, those four photographs?

25 A. Yes.

1 Q. And what is that a picture of?

2 A. The rapids at Roanoke Rapids.

3 Q. And where does it come from?

4 A. My Facebook page.

5 Q. Now, did you make a copy of this Facebook back in
6 2010? Did you copy this in 2010 at that time?

7 A. No.

8 Q. Recently were you -- did you provide Agent -- excuse
9 me, Detective Don Pate with your Facebook page information
10 and come down and open up your Facebook page with him?

11 A. Yes, I did.

12 Q. And were you able to find -- still find the
13 photographs that you had taken back on the early morning
14 hours of the 4th of July of 2010 on your Facebook page?

15 A. Yes.

16 Q. What did it say was the time and date of those photos
17 were taken?

18 A. I believe it was 7:06. 7:06 a.m. on July 4th, 2010.

19 Q. Actually when the photo was downloaded to Facebook,
20 but you say it was only a minute or less?

21 A. Yes.

22 Q. And does State's Exhibit 735 fairly and accurately
23 represent the Facebook page that shows the date, the time,
24 and the photographs that you took on the morning of the 4th
25 of July of 2010 on your fishing trip to Weldon, Roanoke

1 Rapids with the defendant?

2 A. Yes.

3 MR. BUTLER: Your Honor, move to introduce State's
4 Exhibit 735.

5 THE COURT: State's Exhibit 735 is received.

6 Q. Let's see if we can see this. Show you that real
7 quickly. Are these the pictures that we're seeing here on
8 the screen?

9 A. Yes.

10 Q. And those have -- one of the pictures, can you see
11 the date and time on there?

12 A. Yes.

13 Q. Is that just -- is that still there on Facebook
14 today?

15 A. Yes.

16 Q. Mr. Lockamy, did you -- while you were on your trip
17 with the defendant, this fishing trip, did y'all talk?

18 A. Yes.

19 Q. Were you familiar with whether he was in a
20 relationship with anybody at that time?

21 A. Yes.

22 Q. Tell us what he told you about his relationship or
23 who he was in a relationship with?

24 A. We didn't really talk a whole bunch about him and her
25 relationship. I knew that he was in a relationship with

1 her, they were happy, seemed to be happy, cared for each
2 other.

3 Q. Did he tell you -- did you know what her name was?

4 A. Yes.

5 Q. What did he say her name was?

6 A. Helen.

7 Q. Helen, okay. And did he tell you anything else about
8 Helen or any situation in the relationship?

9 A. That she had a daughter.

10 Q. Did he tell you about how old the daughter was?

11 A. Around four.

12 Q. When y'all were talking, did the defendant tell you
13 anything about what was going to be happening in the very,
14 very near future from the 4th -- as you're on the Sunday
15 morning?

16 A. Yes, sir.

17 Q. What did he tell you?

18 A. That he would be watching her for about two weeks
19 because she would be going away to New Mexico for training
20 for the military.

21 Q. You say he was going to be watching, are you talking
22 -- who is her?

23 A. The little girl.

24 Q. So, he told you he was going to be watching the
25 little girl or Helen's little girl while she was gone for

1 two weeks?

2 A. Yes.

3 Q. Did he say anything about any issues with that?

4 A. No, didn't seem to be worried about it or concerned.

5 Q. Did you have some questions about it?

6 A. I was just wondering how he was going to watch her
7 while he was at work.

8 Q. So, you asked him -- did you ask him that?

9 A. Yes.

10 Q. So, you asked how you going to watch her when you're
11 at work?

12 A. Yes.

13 Q. What was the defendant's response to that?

14 A. That his grandparents would be watching her while he
15 was at work.

16 Q. Said his grandparents were going to do that?

17 A. Yes, sir.

18 Q. And then what did he tell you would happen after he
19 got back from work?

20 A. That he would take her and watch her.

21 Q. Did that answer your question?

22 A. Yes.

23 Q. Did y'all talk any more about it as far as you know
24 or remember?

25 A. Not that I can recall.

1 Q. At any time during the time you were on this fishing
2 trip with him, did he make -- express any reservations or
3 concerns or whatnot in regards to watching this little --
4 the four-year old of Helen -- his girlfriend, Helen?

5 A. No.

6 Q. After y'all finished -- what time of the day did
7 y'all finish fishing approximately?

8 A. I'd say around 2:00.

9 Q. What did you do then?

10 A. Went home.

11 Q. Did the defendant drop you off first?

12 A. Yes.

13 Q. After you got dropped off, what happened next?

14 A. It was July 4th, so I believe I ended up --

15 Q. Did you see any more that day?

16 A. No, not any more that day.

17 Q. I was going to ask you about that. You said that --
18 let me also ask you did you know where Jonathan lived at the
19 time you were talking to him about this situation?

20 A. I knew that he lived at his grandparents in an
21 opposite building. I didn't know how or what it was like.

22 Q. You'd never been out there?

23 A. No, sir.

24 Q. Ever visited his place or anything?

25 A. No.

1 Q. But you did know that he stayed at his grandparents
2 when he told you that?

3 A. Yes.

4 Q. Now, sometime later did you see Jonathan at the
5 worksite?

6 A. Yes, I did.

7 Q. What day of the week and the date did you see
8 Jonathan at the worksite?

9 A. Tuesday, the 13th.

10 Q. Now, when you talked to the police, do you recall
11 what day that was that you talked to them?

12 A. I don't.

13 Q. Do you have your statement with you?

14 A. Yes. Yes, I do.

15 Q. Would it help you to look at that statement so you
16 can refresh your memory about the time and date that you
17 talked to the detective?

18 A. 7/28/2010.

19 Q. I think if you'll look down in the typewritten part
20 where it says Andrew Lockamy was interviewed?

21 A. I'm sorry, July the --

22 Q. Read that and tell us if that refreshes your memory
23 as to when you were interviewed by the detective.

24 A. Yes.

25 Q. When were you interviewed by the detective?

1 A. It was July 19th, 2010, approximately 4:28 p.m.

2 Q. So, this is just after this all came out with Teghan;
3 is that right?

4 A. Yes.

5 Q. Now, when you saw -- when you went out to the
6 worksite you said you do recall which day it was?

7 A. Yes.

8 Q. What day of the week was it?

9 A. It was a Tuesday.

10 Q. And what date was it?

11 A. The 13th.

12 MR. BUTLER: May I approach, Your Honor?

13 THE COURT: Well --

14 MR. BUTLER: Sir?

15 THE COURT: How much more direct --

16 MR. BUTLER: Very close to finish. Very, very
17 close.

18 THE COURT: How much cross do you think you'll
19 have?

20 MR. BROUN: Not much.

21 Q. This, again, is State's Exhibit 61. Can you see
22 that?

23 A. Yes, sir.

24 Q. And can you take -- if you would take a -- just write
25 -- take and write work, not to big on the area where it says

1 13th.

2 A. Right here?

3 Q. Yeah. That's the date that you saw him at the
4 worksite; is that right?

5 A. Yes, sir.

6 Q. Thank you. Mr. Lockamy, did you -- when you got
7 there, what were you going there for?

8 A. Delivering material.

9 Q. Who was there at the worksite?

10 A. Jonathan.

11 Q. Was anybody else with him?

12 A. No.

13 Q. Now, did Jonathan work -- were you familiar with his
14 work situation as far as whether he worked as a team or by
15 himself?

16 A. Yes.

17 Q. What did he do?

18 A. To begin with he worked with a guy named Castro. And
19 I don't remember how long it took, but it was probably a
20 couple of months they started kind of slowly going to places
21 by themselves and working by themselves.

22 Q. So, he would work by himself. What kind of work did
23 he do for the company, Carroll Construction?

24 A. Odds and ends and when I was -- towards the end
25 building decks.

1 Q. Building decks. So, around in June, July he was
2 building decks; is that correct?

3 A. Yes, sir.

4 Q. Is that what he was doing on the 13th of July 2010?

5 A. Yes.

6 Q. Where was it you saw him, sir?

7 A. Island Creek.

8 Q. Where -- is that a subdivision?

9 A. Yes, it is.

10 Q. And where is Island Creek in relation to where we are
11 now?

12 A. About -- I'd say maybe ten to 15 miles away down
13 1010.

14 Q. Is it in the -- what town is it closest to?

15 A. I would say the Cleveland area.

16 Q. Cleveland area. It was over near the interstate?

17 A. Kind of.

18 Q. And did you -- are you familiar where Brogden is?

19 A. Yes.

20 Q. How far away is it from Brogden, the Brogden area?

21 A. I would say maybe 30, 45 minutes.

22 Q. But it's on the other part of the county; is that
23 right?

24 A. Yes.

25 Q. When you got there and saw the defendant as he was

1 working, was he actually in fact working on the deck?

2 A. Yes.

3 Q. Tell us what happened when you got there and if
4 anything was said.

5 A. I dropped off my material that I had and we were just
6 talking. And I asked how watching the little girl was going
7 and he said it was going great. He said that she was the
8 smartest girl that he'd ever met at that age and that
9 sometimes she would even call him Daddy.

10 Q. Did you ask how he liked -- how the little girl liked
11 him?

12 A. Yes.

13 Q. And he said she sometimes called him Daddy?

14 A. Yes.

15 Q. How did he act when you were talking to him on July
16 13th of 2010 about the situation that he was watching
17 Teghan? How did he act?

18 A. He acted fine. He didn't seem stressed, didn't seem
19 worried or flustered, and he seemed like he was kind of
20 happy to be watching her. None of it seemed to bother him
21 really.

22 Q. He seemed happy to be watching her?

23 A. Yes.

24 Q. Did you get -- how close did you get to him?

25 A. Maybe two, three foot from him.

1 Q. Did you notice anything about -- did he have the odor
2 of alcohol about his breath or person?

3 A. No.

4 Q. Did he seem impaired in any way?

5 A. No, sir.

6 Q. Did he seem to have any problems on any level at the
7 time you saw him?

8 A. No.

9 Q. When you went fishing with him on the 4th of July,
10 the night of the 3rd of July, did he drink -- was he
11 drinking that night?

12 A. I don't remember seeing any.

13 Q. If he had drank anything, did he drink to excess in
14 any way, shape, or form?

15 A. No.

16 Q. Do any drugs that night -- that day or night?

17 A. Not that I know of.

18 Q. Did he express any issues with watching Teghan Skiba
19 on the 13th of July of 2010 when you saw him?

20 A. No.

21 Q. Seem any different than any other day you'd gone out
22 to his worksite?

23 A. No.

24 MR. BUTLER: No further questions, Your Honor.

25 THE COURT: Any cross?

1 MR. BROUN: No. No, sir.

2 THE COURT: Thank you very much, sir. You can
3 step down.

4 MR. BUTLER: May he be released?

5 MR. BROUN: No objection.

6 THE COURT: He may. Members of the jury, we'll
7 take our evening recess at this time. Thank you for bearing
8 with us just a little bit beyond our usual hour.

9 During your evening recess, of course, please
10 remember to continue to refrain from discussing the case with
11 anyone. Remember to avoid communications with people involved
12 in the case. Continue to avoid press coverage of this case.
13 I'm certainly not banning you from visiting any social media
14 sites including Facebook, but please don't visit website or
15 Facebook page of Drew Lockamy. Keep your minds open and abide
16 by all the other instructions.

17 If you'll leave your materials in your seats along
18 with your badges and we'll see you folks in the morning at
19 9:30. Have a good evening.

20 Everybody remain seated while the jurors leave.

21 (Jury out 4:42.32.)

22 THE COURT: In the absence of the jury, who do you
23 think will start in the morning? Do you know?

24 MR. JACKSON: No.

25 THE COURT: When will Doctor Trice-McNeal, is that

1 her name, be testifying?

2 MR. BUTLER: Later.

3 MR. JACKSON: Later in the week.

4 MR. BUTLER: Later in the week.

5 THE COURT: How about the medical examiner? I'm
6 just trying to think about planning regarding issues of
7 photos.

8 MR. BUTLER: Right. We're working on that.

9 THE COURT: Won't be tomorrow?

10 MR. BUTLER: It could be, but I doubt it. I doubt
11 it'll be tomorrow.

12 THE COURT: Won't be first thing in the morning?

13 MR. BUTLER: It will not be the first thing
14 tomorrow, I can guarantee that.

15 THE COURT: All right. And then how about Doctor
16 Cooper?

17 MR. BUTLER: Later. Later.

18 THE COURT: This week perhaps?

19 MR. BUTLER: Depends on if we go into next week or
20 not, but it'll be later.

21 THE COURT: Okay. Just don't forget we need to
22 allocate a fairly significant block of time for her before she
23 testifies.

24 MR. BUTLER: Yes, sir. We'll let you know.

25 THE COURT: All right. Anything for the State

1 before we recess?

2 MR. BUTLER: No, Your Honor.

3 MR. JACKSON: No.

4 THE COURT: For the defendant?

5 MR. BROUN: No, sir.

6 THE COURT: 9:30 in the morning, Sheriff.

7 (Overnight recess 4:44:13.)

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EXHIBIT E

EXHIBIT E – Summary of Prominent Odontologists

Rejecting Bite-Mark Comparison Evidence

- **Dr. C. Michael Bowers** – Dr. Bowers has more than 30 years of experience in the field of forensic dentistry, and testified as a bite-mark expert as early as the 1980s, after he became a diplomate of the American Board of Forensic Odontology. But by the mid-1990s, Dr. Bowers had changed his mind, and concluded that there is no reliable scientific foundation to support bite-mark comparison testimony. He has written extensively on this topic, and has continued to urge practitioners and courts to reject bite-mark comparison evidence as junk science.
- **Dr. Michael West** – Dr. West is a forensic dentist who testified that bite marks found on victims matched the dentition of suspects in at least thirty-eight trials (including several that resulted in later exonerations based on DNA evidence). Dr. West has now renounced his prior position and explained that he now considers bite-mark comparison evidence to be unreliable. Specifically, Dr. West testified in a deposition that he "no longer believe[s] in bite-mark analysis. I don't think it should be used in court."
- **Dr. Iain Pretty** – Dr. Pretty is a professor of Public Health Dentistry at the University of Manchester, and the chairman of the American Academy of Forensic Science Committee on Forensic Odontology. Dr. Pretty has been a vocal critic of bite-mark comparison evidence for years. In his recent testimony to the Texas Forensic Science Commission, he noted that there is an "incredible lack of reliability [among ABFO diplomates] in stating whether or not injuries are bitemarks," and that "the level of reliability of injury assessment for bitemarks is not currently satisfactory" among more than 40% of the ABFO's active membership."
- **Dr. Adam Freeman** – Dr. Freeman is a former president of the American Board of Forensic Odontology. He testified before the Texas Forensic Science Commission that "[a] link to a suspected biter to the exclusion of all others," or, indeed, "any form of positive" linkage," even using the term 'probable linkage' is inappropriate," for a forensic odontologist to offer as expert testimony "due to the risk of false positive being too high."
- **Dr. Constantine Karazulas** - Dr. Karazulas is a Connecticut-based forensic odontologist with more than 50 years of experience in general dentistry. He served as the Chief Forensic Odontologist of the Connecticut State Police Forensic Science Laboratory who reviewed and investigated thousands of bite marks, and consulted on between 50 and 100 bite mark cases. During the 2000s, Dr. Karazulas offered key testimony on behalf of the prosecution in multiple homicide cases by identifying the "biter" who inflicted an injury on the victims in those cases. However, Dr. Karazulas has changed his mind completely regarding the validity of such testimony. Dr. Karazulas recently testified under oath that he now considers bite-mark comparison evidence to be "junk science," and that the scientific understanding on which he based his prior testimony has "now been significantly altered, if not entirely repudiated by the authoritative experts in the field of forensic odontology." Dr. Karazulas was thus compelled "as a matter of [his]

professional ethics and civic duty, **to recant completely**" his prior testimony.

- **Dr. Cynthia Brzozowski** – Dr. Brzozowski is a New York-based dentist with more than thirty years of experience, who is a Fellow in the American Academy of Forensic Sciences and a member of the American Society of Forensic Odontology. She is also a diplomate in the American Board of Forensic Odontology and a member of its Board of Directors. Dr. Brzozowski testified that while she once believed that bite-mark comparison evidence could be reliable, she no longer believes that such comparisons are based on "valid science."
- **Dr. Mary Bush** - Dr. Mary Bush, a forensic dentist and tenured research professor at State University of New York at Buffalo, has performed groundbreaking research demonstrating the lack of reliability inherent in bite-mark comparisons. In several articles published in peer-reviewed journals, Dr. Bush has demonstrated that skin is not a reliable medium for recording the dentition of a biter. In a series of tests involving cadavers, Dr. Bush discovered that the same set of teeth would make marks that were different. Dr. Bush does not believe that bite-mark comparison evidence can reliably be used to make positive associations in criminal proceedings.

EXHIBIT D

CASE NO. S223651
(PRIOR SUPREME COURT CASE NO. S189275)

**IN THE SUPREME COURT
OF THE STATE OF CALIFORNIA**

William Joseph Richards,
Petitioner,

VS.

**Robert A. Fox, Warden, California Medical Facility, and
California Department of Corrections and Rehabilitation,**
Respondents.

ON PETITION FOR WRIT OF HABEAS CORPUS
APPEAL FROM THE DECISION OF THE COURT OF APPEAL,
FOURTH APPELLATE DISTRICT, DIVISION TWO,
HABEAS CASE NO. E049135
(PRIOR COURT OF APPEAL CASE NO. E024365)
ON APPEAL FROM THE SUPERIOR COURT, COUNTY OF SAN BERNARDINO,
HABEAS CASE NO. SWHSS700444
(PRIOR TRIAL CASE NO. FVI00826)

HONORABLE MARGARET POWERS (RET.)

**APPLICATION FOR LEAVE TO FILE *AMICI CURIAE* BRIEF OF MICHAEL J. SAKS,
THOMAS ALBRIGHT, THOMAS L. BOHAN, BARBARA E. BIERER AND 34 OTHER
SCIENTISTS, STATISTICIANS AND LAW-AND-SCIENCE SCHOLARS AND
PRACTITIONERS IN SUPPORT OF THE PETITION FOR WRIT OF HABEAS CORPUS
BY WILLIAM JOSEPH RICHARDS**

David L. Faigman (SBN 154008)
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RECEIVED

JUN 16 2015

CLERK SUPREME COURT

ATTORNEY FOR *AMICI CURIAE*
ADDITIONAL *AMICI CURIAE* LISTED ON INSIDE COVER

OTHER *AMICI CURIAE*

Michael Bowers
Mary A. Bush
Peter J. Bush
Arturo Casadevall
Simon A. Cole
M. Bonner Denton
Shari Seidman Diamond
Rachel Dioso-Villa
Jules Epstein
David Faigman
Lisa Faigman
Stephen E. Fienberg
Brandon L. Garrett
Paul C. Giannelli
Henry T. Greely
Edward Imwinkelried
Allan Jamieson
Karen Kafadar
Jerome P. Kassirer
Jonathan "Jay" Koehler
David Korn
Jennifer Mnookin
Alan B. Morrison
Erin Murphy
Nizam Peerwani
Joseph L. Peterson
D. Michael Risinger
George F. Sensabaugh, Jr.
Clifford Spiegelman
Hal Stern
William C. Thompson
James L. Wayman
Sandy Zabell
Ross E. Zumwalt

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**TO THE HONORABLE CHIEF JUSTICE TANI G. CANTIL-SAKAUYE,
AND ASSOCIATE JUSTICES OF THE SUPREME COURT OF
CALIFORNIA:**

Pursuant to California Rule of Court 8.520(f), the following scientists, statisticians, and law-and-science scholars or practitioners seek leave to appear as *amici curiae* in this matter: Thomas Albright, Thomas L. Bohan, Barbara E. Bierer, Michael Bowers, Mary A. Bush, Peter J. Bush, Arturo Casadevall, Simon A. Cole, M. Bonner Denton, Shari Seidman Diamond, Rachel Dioso-Villa, Jules Epstein, David Faigman, Lisa Faigman, Stephen E. Fienberg, Brandon L. Garrett, Paul C. Giannelli, Henry T. Greely, Edward Imwinkelried, Allan Jamieson, Karen Kafadar, Jerome P. Kassirer, Jonathan “Jay” Koehler, David Korn, Jennifer Mnookin, Alan B. Morrison, Erin Murphy, Nizam Peerwani, Joseph L. Peterson, D. Michael Risinger, Michael J. Saks, George F. Sensabaugh, Jr., Clifford Spiegelman, Hal Stern, William C. Thompson, James L. Wayman, Sandy Zabell and Ross E. Zumwalt (collectively, “*amici*”). *Amici* respectfully request leave to file the attached *amicus* brief in support of the petition for writ of habeas corpus by William Joseph Richards.

In accordance with California Rule of Court 8.250(f)(4), no party or counsel for any party, other than counsel for *amici*, have authored the proposed brief in whole or in part or funded the preparation of the brief. This brief is timely, as it is filed within 30 days after the last reply brief was filed.

STATEMENT OF INTEREST

Amici are a diverse group of scientists, statisticians, and law-and-science scholars or practitioners who value and encourage the thoughtful use of sound science by the courts. We write in the interest of helping the Court to gain a clearer and more complete understanding of the scientific issues at the heart of the case at bar. No overall characterization can adequately summarize our wide-ranging backgrounds; provided below is biographical information about each of the brief's authors. The views expressed in the attached Brief represent those of the individual authors/cosigners and not necessarily of the institutions with which they are associated.

Petitioner was convicted on the basis of the now-recanted testimony of Dr. Norman Sperber, who claimed that an impression “on the victim’s hand was a bite mark matching [P]etitioner’s unusual dentition.” (Pet. at 33) However, forensic analysis of bitemark evidence is generally riddled with a number of unresolved questions regarding accuracy, reliability, bias, proper technique and application, and others. *Amici*’s proposed brief provides much-needed context and history to explain the reliability and scientific underpinning, or lack thereof, of claims that bitemarks can be used to reliably identify a suspected biter. The brief of *Amici* will provide critical, focused assistance to the Court in understanding: that the history, research, and practice of forensic odontology has been misunderstood by the courts for years; the difficulties inherent in identifying whether an injury is a bitemark in the first instance; the difficulties inherent in linking bitemarks on the

skin of crime victims to their source; that the available empirical research suggests that, except in the most unusual circumstances, forensic odontology currently does not possess the ability to offer reliable and valid bitemark identifications to the courts; and that the latent uncertainty in the current state of forensic odontology undermines the probative value of any individual identification of the source of a bitemark.

Amici's proposed brief incorporates a broad array of insight, experience, and expertise in odontology, forensic certainty, evidentiary sufficiency, and other related specialties, which *Amici* submit will assist the Court in understanding the fundamental uncertainty underlying the use of bitemark evidence to reliably identify a suspect. A brief description of the background and work of each of the *amici* is as follows:

Amicus **Thomas Albright**, Ph.D. (psychology and neuroscience), trained at Princeton University, is professor and director of the Vision Center Laboratory at the Salk Institute. He is a researcher whose lab focuses on the neural structures and events underlying perception of motion, form, and color. His recent studies have uncovered the existence of multiple brain areas devoted to the detection, analysis, and interpretation of specific types of visual information. Albright is a member of the National Academy of Sciences, chaired the NAS committee on eyewitness identification, and has been a consultant to the National Commission on Forensic Science.

Amicus **Thomas L. Bohan**, Ph.D., J.D., President of the American Academy of Forensic Sciences, 2009-2010, and currently President of the Forensic Specialties Accreditation Board, holds his physics Ph.D. from the University of Illinois-Urbana/Champagne and his law degree from the University of New Hampshire School of Law. He has authored books and peer-reviewed papers in the scientific and legal professional literature. Reflecting his interest in forensic science and its admission into evidence, these publications include early commentary on the *Daubert* decision and an extensive review of the 2009 National Academy of Science report *Strengthening Forensic Science in the United States*. He resides on Peaks Island in the State of Maine.

Amicus **Barbara E. Bierer**, M.D., is a Professor of Medicine at Harvard Medical School and the Brigham and Women's Hospital. She is the Program Director of the Regulatory Foundations, Law and Ethics Program. Dr. Bierer directs the Multi-Regional Clinical Trials Center at Harvard, a University-wide effort to improve standards for the planning and conduct of clinical trials. She has served as Senior Vice President, Research, at the BWH. Bierer also served as the Chair of the Secretary's Advisory Committee for Human Research Protections, DHHS, and is currently a member of the National Academies of Sciences Committee on Science, Technology and the Law. She has authored or co-authored over 180 publications and is on the editorial boards of a number of journals, including *Current Protocols of Immunology*. Bierer received a B.S. from Yale University and an M.D. from Harvard Medical School.

Amicus **Michael Bowers** is a practicing dentist and an Associate Clinical Professor at The Ostrow School of Dentistry of USC. Over many years he has collaborated with notable legal and forensic dental colleagues to improve the methods and results in forensic identification. His accompanying intent has been to inform the Criminal Justice system about bitemark identifiers' scientifically unsubstantiated and dangerous claims of certainty and reliability. Some of his empirical studies and reporting in published peer reviewed books and articles on this subject were cited in the 2009 NAS report as a partial basis for its bitemark findings contained in that document.

Amicus **Mary A. Bush, DDS**, is an Associate Professor at SUNY at Buffalo School of Dental Medicine. She is Past President of the American Society of Forensic Odontology, is a Fellow of the American Academy of Forensic Sciences, and is Director for the Laboratory for Forensic Odontology Research, University at Buffalo. She is on the Editorial Board for the *Journal of Forensic Science*, has published numerous articles, has contributed to various textbooks, and lectures widely on the topic of forensic odontology including an invited presentation at a congressional hearing on Capitol Hill. She serves on the Odontology Subcommittee of the Organization of Scientific Area Committees ("OSAC") of the National Institute of Standards and Technology ("NIST").

Amicus **Peter J. Bush** is Director of the South Campus Instrument Center at the State University of New York School of Dental Medicine and Adjunct Professor of Art Conservation at Buffalo State College. He is a co-founder of the

Laboratory for Forensic Odontology Research and a Fellow of the American Academy of Forensic Sciences. He is a member of the Research Committee for the American Society of Forensic Odontology. Mr. Bush has worked in many scientific areas, including Forensic Odontology. He has published over 60 articles and his work is referenced in numerous sources including the NASA website.

Amicus **Arturo Casadevall** is the Bloomberg Distinguished Professor and chair of the Molecular Microbiology and Immunology department at Johns Hopkins School of Public Health. He received his M.D. and Ph.D. from New York University. Subsequently, he completed internship and residency in internal medicine at Bellevue Hospital. Casadevall has authored over 630 scientific papers. He was elected to membership in the American Society for Clinical Investigation, the American Academy of Physicians, the American Academy of Microbiology and the Institute of Medicine (of the National Academy of Sciences).

Amicus **Simon A. Cole** is Professor of Criminology, Law & Society at the University of California, Irvine and Director of The Newkirk Center for Science & Society. He holds a Ph.D. in Science & Technology Studies from Cornell University. He is the author of *Suspect Identities: A History of Fingerprinting and Criminal Identification* (Harvard University Press, 2001) and more than 20 scholarly articles and book chapters about forensic evidence. He is a member of the Human Factors Subcommittee of the National Commission on Forensic Science, and he is Co-Editor of the journal *Theoretical Criminology*.

Amicus **M. Bonner Denton** is recognized as a world leader in scientific optical imaging and development of new analytical instrumentation. His work has been recognized through numerous awards and today he is a Fellow of the American Association for the Advancement of Science, the Royal Society of Chemistry; the American Chemical Society, and the Society for Applied Spectroscopy. He received his Ph.D. in Chemistry in 1972 from the University of Illinois and is currently a Galileo Professor of Chemistry and Professor of Geological Sciences at the University of Arizona. He served as co-author of the National Research Council Report, *Strengthening Forensic Science in the United States*, and is a Member of the National Commission on Forensic Science.

Amicus **Shari Seidman Diamond** is the Howard J. Trienens Professor of Law and Professor of Psychology at Northwestern University, where she directs the J.D./Ph.D. program, and a research professor at the American Bar Foundation. Professor Diamond has published more than a hundred articles on legal decision-making in law reviews and behavioral science journals. She was elected to the American Academy of Arts and Sciences. She has been on advisory boards of the National Science Foundation, National Academy of Sciences (Panel on the Evaluation of Forensic DNA Evidence), National Center for State Courts, Federal Judicial Center, American Bar Association, and American Judicature Society. Her publications have been cited by federal and state courts, including the U.S. Supreme Court.

Amicus **Rachel Dioso-Villa**, Ph.D., is a Lecturer in the School of Criminology and Criminal Justice at Griffith University, Australia. Her research investigates the admissibility of the forensic sciences, the validation of forensic science techniques, specifically fire investigation expertise, and the causes and correlates of wrongful conviction. Her work has appeared in the *Stanford Law Review*, *Canadian Journal of Criminology*, *Law Probability and Risk* and the *Wall Street Journal*. She has received grants and fellowships from the Social Science and Humanities Research Council of Canada, the American Society of Criminology and the Canadian Foundation of University Women.

Amicus **Jules Epstein** is a Professor of Law at Widener University School of Law, where he teaches Evidence, Criminal Procedure and Criminal Law and is Director of the Taishoff Advocacy, Technology and Public Service Institute. He is faculty for the National Judicial College, teaching Evidence and Capital Case courses. Professor Epstein has worked on two DNA workgroups for NIJ, and on a working group on latent print issues for the NIST. He is co-editor of *Scientific Evidence Review: Admissibility and the Use of Expert Evidence in the Courtroom*, *Monograph NO. 9* (ABA, 2013) and *The Future of Evidence* (ABA, 2011) and served as section editor for the *Encyclopedia of Forensic Sciences*, 2nd Edition (2013). Professor Epstein has lectured on forensics to judges and attorneys.

Amicus **David Faigman** is the John F. Digardi Distinguished Professor of Law at the University of California, Hastings, and a Professor in the School of Medicine (Department of Psychiatry) at UCSF. He is the author of numerous

books and articles on the use of scientific research in legal decision making. He is also a co-author/co-editor of the five-volume treatise *Modern Scientific Evidence: The Law and Science of Expert Testimony* (with Blumenthal, Cheng, Mnookin, Murphy & Sanders). Professor Faigman was a member of the National Academies Committee that studied the validity of polygraphs and is a member of the MacArthur Law and Neuroscience Network.

Amicus **Lisa Faigman** is a Visiting Professor at the University of California, Hastings College of Law. Her teaching and research areas include forensic evidence, wrongful conviction, evidence, criminal procedure, and the general intersection of science and law.

Amicus **Stephen E. Fienberg** is Maurice Falk University Professor of Statistics and Social Science at Carnegie Mellon University, and co-director of the Living Analytics Research Centre with appointments in the Department of Statistics, the Machine Learning Department, the Heinz College, Cylab and the Human Rights Science Center. He is the author or editor of over 25 books and 500 papers and related publications, several of which deal with forensic statistics topics. He is a member of the National Academy of Sciences, and a fellow of the Royal Society of Canada, the American Academy of Arts and Sciences, and the American Academy of Political and Social Science. In January 2014 he was appointed as a member of the National Commission on Forensic Science.

Amicus **Brandon L. Garrett** is a Professor of Law at the University of Virginia, where he has taught since 2005. His research and teaching interests

include criminal procedure, wrongful convictions, habeas corpus, corporate crime, scientific evidence, and constitutional law. Garrett's recent research includes studies of DNA exonerations and organizational prosecutions. Garrett's book examining corporate prosecutions, titled *Too Big to Jail: How Prosecutors Compromise with Corporations*, was published by Harvard University Press in 2014. In 2011, Harvard University Press published Garrett's book, *Convicting the Innocent: Where Criminal Prosecutions Go Wrong*, examining the cases of the first 250 people to be exonerated by DNA testing. Garrett attended Columbia Law School, where he was an articles editor of the Columbia Law Review. He clerked for the Honorable Pierre N. Leval of the U.S. Court of Appeals for the Second Circuit. He then worked as an associate at Neufeld, Scheck & Brustin LLP in New York City.

Amicus **Paul C. Giannelli** is a Distinguished University Professor and the Albert J. Weatherhead III & Richard W. Weatherhead Professor of Law at Case Western Reserve University. He received his J.D. degree from the University of Virginia, where he served as Articles Editor of the Virginia Law Review. His other degrees include an LL.M. from the University of Virginia, an M.S. in Forensic Science from George Washington University, and a B.A. from Providence College. He served as both a prosecutor and defense counsel in the military. Giannelli has written extensively in the field of evidence and criminal procedure, especially on the topic of scientific evidence. He has authored or co-authored twelve books, including *Scientific Evidence* (5th ed. 2012), and has

written over 200 articles and other works, mostly on scientific evidence and the law. He is co-author of the chapter on forensic science in *Federal Judicial Center, Reference Manual on Scientific Evidence* (3d ed. 2011). Giannelli's work has been cited in nearly 700 judicial opinions throughout this country (including seven decisions of the U.S. Supreme Court), as well as in foreign courts. Among other service, he is a commissioner, National Commission on Forensic Science and a member, National Academy of Sciences, Bullet Lead Elemental Composition Comparison Committee.

Amicus **Henry T. Greely** is Deane F. and Kate Edelman Johnson Professor of Law and Professor, by courtesy, of Genetics at Stanford University. He specializes in ethical, legal, and social issues arising from the biosciences. He chairs the California Advisory Committee on Human Stem Cell Research and directs the Stanford Center for Law and the Biosciences and the Stanford Program in Neuroscience and Society. He is a member of the Committee on Science, Technology, and Law of the National Academy of Sciences and the Institute of Medicine's Neuroscience Forum. In 2007, he was elected a fellow of the American Association for the Advancement of Science.

Amicus **Edward Imwinkelried** is the Edward L. Barrett, Jr. Professor of Law Emeritus at the University of California, Davis. He is the coauthor of *Scientific Evidence* (5th ed. 2012) and "Reference Guide on Forensic Identification Expertise," *Reference Manual on Scientific Evidence* (3d ed. 2011). He was a member of the NIST expert working group that released *Latent Print*

Examination and Human Factors: Improving the Practice Through a Systems Approach (2012). He served as the Legal Consultant to the Surgeon General's Commission on Urinalysis Testing in the Armed Forces. He is a contributing editor on scientific evidence to *Criminal Law Bulletin* and was formerly the expert testimony columnist for *National Law Journal*.

Amicus **Allan Jamieson** is a forensic scientist in the U.K. He holds a Ph.D. in forensic science from Strathclyde University. He is a Visiting Professor of Forensic Sciences at Staffordshire University, Editor in Chief of *Wiley's Encyclopaedia of Forensic Sciences* and has published in peer-reviewed and other journals. He was external examiner for forensic sciences at Edinburgh University and the University of Kent at Canterbury; Visiting Professor of Forensic Biology at Napier University, Edinburgh; head of Lothian & Borders Police Forensic Science laboratory; a director of Forensic Alliance; chair of the United Kingdom Forensic Toxicology Forum; chair of the Standards Committee and the Academic and Education Committee of the Forensic Science Society; and a member of the editorial board of *Clarke's Analysis of Drugs & Poisons*. He has testified in criminal cases in Scotland, Northern Ireland, England and Wales, the U.S., Australia, New Zealand, and Cyprus, and has been involved in thousands of criminal cases as an expert.

Amicus **Karen Kafadar** is Commonwealth Professor & Chair of Statistics at University of Virginia. She received her Ph.D. in Statistics from Princeton University, and previously held positions at NIST, Hewlett Packard, NCI,

University of Colorado-Denver, and Indiana University. Her research focuses on robust methods, exploratory data analysis, and characterization of uncertainty in the physical, chemical, biological, and engineering sciences. She has been editor of several journals including, currently, Biology & Genetics Editor for *The Annals for Applied Statistics*. She has served on several National Academy of Sciences committees, including those that led to the reports, *Weighing Bullet Lead Evidence* (2004), *Strengthening Forensic Science in the United States* (2009), *Evaluating Testing, Costs, and Benefits of Advanced Spectroscopic Portals* (2011), and *Identifying the Culprit: Assessing Eyewitness Identification* (2014). She is a member of the Forensic Science Standards Board.

Amicus **Jerome P. Kassirer**, M.D., Distinguished Professor of Medicine at Tufts University School of Medicine and Editor-in-Chief of the New England Journal of Medicine between 1991-1999, has studied the process of diagnosis for 37 years. He is author of numerous scientific papers and review articles on diagnostic reasoning and diagnostic testing and is co-author of “Learning Clinical Reasoning” (Lippincott, 2010). He is coeditor of the most recent issue of the Manual of Scientific Information, the data source for federal judges, and has published on the way information is assessed by the courts. He teaches diagnosis weekly at Tufts Medical Center in Boston and monthly at Stanford University.

Amicus **Jonathan “Jay” Koehler** is the Beatrice Kuhn Professor of Law at Northwestern University School of Law. Koehler has a Ph.D. in Behavioral Sciences from the University of Chicago. He conducts research in how people

reason with forensic and quantitative evidence in legal cases. He teaches classes in statistics and probability, forensic science, decision making, and evidence. He has published dozens of peer-reviewed journal articles, and is an editor of *Law, Probability & Risk*, and a consulting editor of *Judgment and Decision Making*.

Amicus David Korn, M.D., was Stanford University Vice-President and Dean of Medicine, and Professor and Founding Chair of Pathology. Korn served for 11 years as Senior Vice President and Chief Scientific Officer of the Association of American Medical Colleges (AAMC), and then Vice-Provost for Research at Harvard University. He is currently Consultant in Pathology at the Massachusetts General Hospital and Professor of Pathology at Harvard Medical School. He is a member of the Institute of Medicine of the National Academies of Science (NAS). He was a founding member and served as co-chair of the NAS Committee on Science, Technology and Law, which initiated and oversaw the Reports, *Strengthening Forensic Science in the United States*, and *Review of the Scientific Approaches Used During the FBI's Investigation of the 2001 Anthrax Letters*.

Amicus Jennifer Mnookin has been named the Dean of UCLA Law School, and is currently the David G. Price and Dallas P. Price Professor of Law and the Faculty Director of the Program on Understanding Law, Science and Evidence at UCLA Law School. Her scholarship and teaching focus on evidence, especially expert evidence and issues in forensic science. She is a co-author of two evidence treatises, *The New Wigmore: Expert Evidence, and Modern*

Scientific Evidence (where her editorial responsibilities include the chapter on bite mark identification), and she has written numerous academic articles focusing on a variety of forensic identification disciplines, among other topics. She is currently a member of the National Academy of Science's Committee on Science, Technology and Law. In addition to a J.D. from Yale, Mnookin holds an A.B. from Harvard and a Ph.D. from M.I.T.

Amicus Alan B. Morrison is the Associate Dean for Public Interest & Public Service Law at George Washington University Law School. He has served for fifteen years as a member of the Committee on Science, Technology & Law of the National Academy of Sciences, which sponsored the report, *Strengthening Forensic Science in the United States*.

Amicus Erin Murphy is a Professor of Law at New York University School of Law. Murphy's research focuses on forensic evidence and the use of new technologies in the criminal justice system. She is the author of the forthcoming book, *Inside the Cell*, which addresses scientific, legal, and ethical questions raised by forensic DNA testing methods.

Amicus Nizam Peerwani, M.D. is the chief medical examiner for Tarrant County, Texas, and chair of the Texas Forensic Science Commission. His work has included the evaluation of genocide and human rights violations in Rwanda and Bosnia-Herzegovina. Peerwani was honored by Physicians for Human Rights for his human rights work. Peerwani is a graduate of the American University of Beirut (MD '76). He completed his residency in pathology at Baylor University

Medical Center in Dallas, and is board certified in clinical, anatomic and forensic pathology.

Amicus **Joseph L. Peterson**, D.Crim. recently retired as Professor in the School of Criminal Justice and Criminalistics at California State University, Los Angeles. Over the past forty years, Peterson's research has monitored the evolution of the forensic sciences, documenting their growing potential as well as their shortcomings. His research has focused on the uses and effects of scientific evidence at key decision points in the criminal justice system. His work has also explored the quality of crime laboratory results via proficiency testing of examiners, problems associated with the placement of crime laboratories within law enforcement agencies, and ethical dilemmas faced by forensic scientists practicing in an adversarial justice system. Peterson's 2002 and 2005 Census(es) of Publicly Funded Forensic Crime Laboratories for the Bureau of Justice Statistics have documented high caseloads, lengthy backlogs, and severe budgetary and personnel needs. He recently completed two NIJ studies examining the role and impact of scientific evidence in the criminal justice process. Peterson received the Distinguished Fellow Award from the American Academy of Forensic Sciences in 2008.

Amicus **D. Michael Risinger** is a graduate of Yale College and Harvard Law School. He is a life member of the American Law Institute, and a past chair of the Association of American Law Schools' Evidence Section. He was for 25 years a member of the New Jersey Supreme Court Committee on Evidence, and is

currently a member of the Human Factors Subcommittee of the National Commission on Forensic Science. He is the author of two chapters in West's *Modern Scientific Evidence* ("Handwriting Identification" and "A Proposed Taxonomy of Expertise"), and also of articles on a range of subjects, including many articles on expert evidence issues, and on the convicted innocent.

Amicus **Michael J. Saks** is Regents Professor at the Arizona State University where he is on the faculty of the Sandra Day O'Connor College of Law and the Department of Psychology, and is a fellow in the Center for Law, Science, and Innovation. Previously, he was the Edward F. Howrey Professor of Law and Professor of Psychology at the University of Iowa. He has taught courses in scientific evidence to appellate judges in the University of Virginia Law School's LL.M. program and Duke's "Judging Science" program, as well as to law faculty at Georgetown University and Ohio State University. His research interests include forensic science and the law. Saks's is the most-cited research in the NAS report, *Strengthening Forensic Science in the United States*. Among over 200 other publications, he has been co-editor/co-author of *Modern Scientific Evidence* (five volumes) and the *Annotated Reference Manual on Scientific Evidence, Second*. His work has earned a number of awards and has been cited in various judicial opinions, including several by the United States Supreme Court. In addition to his Ph.D., Saks earned an M.S.L. from the Yale Law School.

Amicus **George F. Sensabaugh, Jr.** is Professor Emeritus of Biomedical and Forensic Sciences in the School of Public Health at the University of

California, Berkeley; he also teaches at UC Davis where he is a member of the Graduate Group in Forensic Science. His research interests include the application of the biosciences in forensic science, particularly as applied in sexual assault investigation. He is also engaged in research on the comparative population genetics of staphylococci. Sensabaugh served on the two NAS Committees on DNA Technology in Forensic Science (1988-1992 & 1994-1996) and on the NAS Committee on Assessing the Research Program of the National Institute of Justice (2006-2010). He has served on the editorial boards of several forensic science journals. His professional memberships include the California Association of Criminalists, the American Academy of Forensic Sciences (Paul L. Kirk Award, 1987), and the International Society for Forensic Genetics (President, 18th International Congress, 1999). He holds a B.A. from Princeton University and a Doctor of Criminology from UC Berkeley.

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CONCLUSION

For all of the foregoing reasons, *amici* respectfully request that the Court grant *amici*'s application and accept the enclosed brief for filing and consideration.

CASE NO. S223651
(PRIOR SUPREME COURT CASE NO. S189275)

**IN THE SUPREME COURT
OF THE STATE OF CALIFORNIA**

William Joseph Richards,
Petitioner,

VS.

**Robert A. Fox, Warden, California Medical Facility, and
California Department of Corrections and Rehabilitation,**
Respondents.

ON PETITION FOR WRIT OF HABEAS CORPUS
APPEAL FROM THE DECISION OF THE COURT OF APPEAL,
FOURTH APPELLATE DISTRICT, DIVISION TWO,
HABEAS CASE NO. E049135
(PRIOR COURT OF APPEAL CASE NO. E024365)
ON APPEAL FROM THE SUPERIOR COURT, COUNTY OF SAN BERNARDINO,
HABEAS CASE NO. SWHSS700444
(PRIOR TRIAL CASE NO. FVI00826)

HONORABLE MARGARET POWERS (RET.)

***AMICI CURIAE* BRIEF OF MICHAEL J. SAKS, THOMAS ALBRIGHT, THOMAS L.
BOHAN, BARBARA E. BIERER AND 34 OTHER SCIENTISTS, STATISTICIANS AND
LAW-AND-SCIENCE SCHOLARS AND PRACTITIONERS IN SUPPORT OF THE
PETITION FOR WRIT OF HABEAS CORPUS BY WILLIAM JOSEPH RICHARDS**

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OVERVIEW

This Brief begins by explaining that beliefs about the capacity of bitemark comparisons to accurately identify the source of a questioned bitemark have moved from a period of widespread skepticism (before the mid-1970s) through one of widespread credulity to the current growing return to doubt. It explains that those doubts are based on an emerging recognition that the field stands on a foundation of very thin scientific support – if any at all. A growing body of scientific research and analysis concerning the unsupported claims of bitemark identification are cited, as well as the conclusions of a committee of the National Academy of Sciences regarding bitemark identification.

Part I of the Brief explains the general logic of forensic identification. Part II discusses the claims of bitemark identification against that background of general principles. Part III focuses on studies assessing the accuracy of bitemark identification.

The numerous scientific issues discussed in the course of the Brief are encapsulated immediately following this Overview, in a section titled Summary of Scientific Issues.

SUMMARY OF SCIENTIFIC ISSUES

As detailed in this Brief, the following issues are central to the ability to accurately associate an injury on human skin to the dentition of a specific individual. Yet they have not been validated. Some have been refuted by existing

research. Others remain matters of speculation by forensic dentists attempting bitemark identifications.

Recognizing a bitemark. Is an injury on skin a bitemark or some other type of injury? Objective criteria for making such determinations have not yet been developed, so each examiner makes his or her best judgment. With how much agreement do forensic dentists make this basic determination? Recent research indicates a high disagreement rate. How accurate any such determinations are remains unknown.

Qualities of skin as a substrate. The underlying claim of bitemark identification is not only that all dentitions are unique; it is that every bitemark in skin produced by those dentitions can be associated only with themselves and not be confused with any other dentition. Yet both research and casework observations have confirmed that a single set of teeth creates a range of different markings from one bite to the next. The image of dentition that is recorded also changes owing to stretching or twisting of skin at the time a bite is imposed, reactions of flesh to injury, influences of the environment, the position of the body part as a bitemark is observed, and other factors.

Methods for visualizing and comparing. Assuming the problems already described can be solved, which methods of visualizing and comparing bitemarks with dentition are most reliable and valid and under what circumstances? Are some methods currently in use so undependable that they ought not to be continued in use?

Evaluating similarity between a bitemark and dentition. No criteria exist to guide forensic dentists regarding the inclusion/exclusion of a person's dentition as one that could have made the bite markings observed. As criteria are proposed, the reliability and validity of the inclusion/exclusion judgments they foster need to be empirically tested.

Observer effects. The limited information in, and ambiguity of, bitemarks in skin make the task of bitemark identification vulnerable to well-established "observer" (or "context") effects. What that means is that, below the level of their own awareness, observers tend to resolve ambiguities in the direction of confirming what they are expecting or hoping to see. Forensic dentists have not adopted procedures for protecting their work from errors resulting from such cognitive distortions.

Evaluating the meaning of an inclusion. When a suspect's dentition is similar enough to a bitemark to be judged an "inclusion," how probative is that opinion of an inference that the suspect's dentition actually created the bitemark? Conventionally, forensic dentists relied "on the theory that each person's dentition is unique." It now is recognized that evidence does not support the speculation that dentitions are unique from each other and not confusingly similar. It is now understood that speculations about uniqueness are unsupported by research or any known theory. An alternative, and scientifically sound, basis for evaluating an observation of similarity between a bitemark and suspected biters needs to be developed, but work on the problem has not begun. Though no scientific basis

exists for asserting that any particular person is “the only person in the world” who could have made the bitemark at issue, such unwarranted assertions have been common in the testimony of forensic dentists.

Reliability and validity of odontological decisions regarding bitemark source. Finally, how reliable and valid are the decisions of forensic dentists when they opine that a given suspect dentition is the source of a bitemark? Very little research exists on this essential question, but what does exist produces results that can only be regarded as worrisome.

INTRODUCTION

Amici submit this Brief not to suggest how the Court should apply its jurisdiction’s law to the case at bar. Rather, the Brief’s purpose is to provide the Court with relevant background knowledge regarding the nature, history, and current scientific status of bitemark identification.

Beliefs about the capacity of bitemark comparisons to accurately identify the source of a questioned bitemark have followed a trajectory from widespread skepticism through widespread credulity to a growing return to doubt. That growing doubt is based on the emerging realization that the field stands on a quite limited foundation of scientific fact,¹ that there is “a lack of valid evidence to

¹ Committee on Identifying the Needs of the Forensic Science Community National Research Council, *Strengthening Forensic Science in the United States: A Path Forward* (2009) (hereinafter, NAS Report). The original, and parent, organization, created by Congress in 1863, during the administration of

support many of the assumptions and assertions made by forensic dentists during bite-mark comparisons,² and that error rates by forensic dentists are perhaps the highest of any forensic identification specialty still being practiced.³ In sum, bitemark testimony has been “introduced in criminal trials without any meaningful scientific validation, determination of error rates, or reliability testing....”⁴

Abraham Lincoln, is the National Academy of Sciences. One of its major sub-units is the National Research Council, through which “the NAS provides objective, science-based advice on critical issues affecting the nation.” <http://www.nasonline.org> (last visited June 9, 2015).

² Iain Pretty & David Sweet, *The Scientific Basis for Human Bite Mark Analyses – A Critical Review*, 41 *Science & Justice* 85, 85 (2001). See also Mary A. Bush & Peter J. Bush, *Current Context of Bitemark Analysis and Research*, in *Bitemark Evidence: A Color Atlas and Text* § 6-303 (Robert B.J. Dorion ed., 2010) (2d ed. 2010); Ademir Ranco et al., *The Uniqueness of the Human Dentition as Forensic Evidence: A Systematic Review on the Technological Methodology*, *Int'l J. Legal Med.* (Nov. 15, 2010); Iain A. Pretty & David J. Sweet, *Digital Bitemark Overlays—An Analysis of Effectiveness*, 46 *J. Forensic Sci.* 1385 (2001); NAS Report, at 176; Paul Gianelli, Edward J. Imwinkelried and Joseph L. Peterson, Reference Guide on Forensic Identification Expertise, Federal Judicial Center, *Reference Manual on Scientific Evidence* (3d ed. 2011) (hereinafter, FJC Reference Manual); C. Michael Bowers, *Identification from Bitemarks*, in *Modern Scientific Evidence: The Law and Science of Expert Testimony* (David L. Faigman et al. eds, 2014) (hereinafter, *Modern Scientific Evidence Chapter*).

³ The findings of studies testing bitemark examiners’ ability to correctly identify the source of bitemarks are reviewed, *infra*. The text’s allusion to forensic techniques “still being practiced” refers to several forms of forensic science (voiceprint identification, comparative bullet lead analysis, and a large number of arson “indicators”) that have ceased to be offered to courts following reviews by scientific bodies finding them to lack validity, though prior to those reviews they had frequently been admitted into evidence by courts.

⁴ NAS Report, at 108.

Those realizations have been taken up most prominently in the work of a committee of the National Academy of Sciences, which reviewed the scientific support for the claims of bitemark identification, among others, and found serious deficiencies.⁵ The Committee on Identifying the Needs of the Forensic Science Community was co-chaired by Judge Harry Edwards, of the U.S. Court of Appeals for the D.C. Circuit, who described the Committee's work:

[The Committee spent] more than two years... listening to testimony from and reviewing materials published by countless experts, including forensic science practitioners, heads of public and private laboratories, directors of medical examiner and coroner offices, scientists, scholars, educators, government officials, members of the legal profession, and law enforcement officials. Not only were we trying to understand how the forensic science disciplines operate, we were also trying to determine the extent to which there is any... scientific research to support the validity and reliability of existing forensic disciplines; in particular, we were looking for scientific studies that address the level of accuracy of forensic disciplines that rely on subjective assessments of matching characteristics. We invited experts in each discipline to refer us to any such research....⁶

The Committee completed its work and issued its Report in 2009. Several observations and conclusions can be drawn from the Report relevant to evaluating asserted bitemark identification expertise, including the following.

Bitemark identification was seen as a field in which "forensic science professionals have yet to establish either the validity of their approach or the

⁵ NAS Report.

⁶ Harry T. Edwards, *Solving the Problems that Plague the Forensic Science Community*, 50 *Jurimetrics J.* 5 (2009)

accuracy of their conclusions, and the courts have been utterly ineffective in addressing this problem.”⁷

“Although the majority of forensic odontologists are satisfied that bite marks can demonstrate sufficient detail for positive identification [of a perpetrator], no scientific studies support this assessment....”⁸ “[T]he scientific basis is insufficient to conclude that bite mark comparisons can result in a conclusive match.”⁹

⁷ NAS Report, at 53.

⁸ NAS Report, at 176.

⁹ NAS Report, at 175. Though no scientific basis exists for identifying any particular person as the one and only possible source of a bitemark, such unwarranted assertions have been common in the testimony of forensic dentists. Illustrative of many other case are the following.

In the capital rape-murder trial of Ray Krone in Arizona, two forensic dentists testified: “The teeth of Ray Krone did cause the injuries on the body of [the victim] to a reasonable degree of medical certainty. This represents the highest order of confidence that no other person caused the bite mark injuries.” “I’m certain [of the identification].” (Figure 1 shows one of the evidence photographs from that case, comparing a mold of Krone’s dentition to a bitemark on the murder victim. Ten years after being sentenced to death, Krone was exonerated by DNA.)

At the Wisconsin trial of Robert Lee Stinson, a board-certified, ABFO diplomate concluded that the bitemarks “had to have been made by teeth identical” to Stinson’s, and that there was “no margin for error” in his conclusion. (After 23 years in prison, Stinson was exonerated by DNA.)

At a preliminary hearing in Michigan, the forensic dentist testified that Anthony Otero was “the only person in the world” who could have caused the bitemarks on the victim’s body. (A month later, DNA testing excluded Otero as the perpetrator.)

One reason for doubts about “the value and scientific validity of comparing and identifying bite marks”¹⁰ is the unsatisfactory nature of skin as a substrate for registration of tooth impressions: “Unfortunately, bite marks on the skin will change over time and can be distorted by the elasticity of the skin, the unevenness of the bite surface, and swelling and healing. These features may severely limit the validity of forensic odontology.”¹¹ This aspect of bitemark identification sets it apart from other types of forensic pattern-comparison techniques.

“There is no science on the reproducibility of the different methods of analysis that lead to conclusions about the probability of a match. This includes reproducibility between experts and with the same expert over time. Even when using the guidelines, different experts provide widely differing results and a high percentage of false positive matches of bite marks using controlled comparison studies.”¹²

The NAS Committee recognized the work of cognitive scientists whereby, when viewing ambiguous information, the observer’s mind tends to see what the observer expects or hopes to see.¹³ Ambiguities are resolved as being consistent

¹⁰ NAS Report, at 173.

¹¹ NAS Report, at 174.

¹² NAS Report, at 174.

¹³ See, D. Michael Risinger et al., *The Daubert/Kumho Implications of Observer Effects in Forensic Science: Hidden Problems of Expectation and Suggestion*, 90 Cal. L. Rev. 1 (2002); Itiel Dror et al., *Contextual Information Renders Experts Vulnerable to Make Erroneous Identifications*, 156 Forensic Sci. Int’l 74 (2006). The NAS Report called for further research regarding this problem.

with expectations, and bitemark experts do not generally employ procedures for preventing such errors: “[F]orensic odontology suffers from the potential for large bias among bite mark experts in evaluating a specific bite mark in cases in which police agencies provide the suspects for comparison and a limited number of models from which to choose from in comparing the evidence. Bite marks often are associated with highly sensationalized and prejudicial cases, and there can be a great deal of pressure on the examining expert to match a bite mark to a suspect. Blind comparisons and the use of a second expert are not widely used.”¹⁴

In concluding that “[m]ore research is needed to confirm the fundamental basis for the science of bite mark comparison,” the NAS Report summarized “[s]ome of the basic problems inherent in bite mark analysis and interpretation” as follows:

- (1) The uniqueness of the human dentition has not been scientifically established.
- (2) The ability of the dentition, if unique, to transfer a unique pattern to human skin and the ability of the skin to maintain that uniqueness has not been scientifically established.
 - i. The ability to analyze and interpret the scope or extent of distortion of bite mark patterns on human skin has not been demonstrated.
 - ii. The effect of distortion on different comparison techniques is not fully understood and therefore has not been quantified.

¹⁴ NAS Report, at 175.

(3) A standard for the type, quality, and number of individual characteristics required to indicate that a bite mark has reached a threshold of evidentiary value has not been established.¹⁵

I. THE LOGIC OF FORENSIC IDENTIFICATION - GENERALLY

Forensic identification, including bitemark identification, involves two indispensable steps.¹⁶ The first step is to compare the crime scene markings to the possible sources of that mark.¹⁷ The examiner compares images of the questioned markings to those from the known and makes a judgment about whether they differ to an extent that the suspect should be excluded as the source, or that the similarities seem so great that the suspect should be included in the pool of possible contributors. In the case of crime scene markings created by one object leaving markings of itself on another object – such as a fingerprint onto a surface, a firearm barrel onto a bullet, or teeth onto skin – the faithfulness of the transfer from the original to the receiving surface, and the ability of the receiving surface to retain the impression unchanged, are essential to the probativeness of the comparison of the mark on the receiving surface to a suspected source.

¹⁵ NAS Report, at 175-76.

¹⁶ Allan Jamieson, *The Philosophy of Forensic Scientific Identification*, 59 Hastings L.J. 1031 (2008).

¹⁷ In regard to DNA, what we refer to as “markings” or “marks” would be equivalent to the visualizations of the DNA – at one time in the form of autorads, now as electropherograms.

A. Problems with Declaring a “Match”

In comparing the images of the questioned and the known, if examiners are left to their own subjective judgment of how similar two images need to be in order to declare them similar enough to be included in the pool, then inconsistencies will occur when different examiners look at the same evidence. The less well the criteria are defined and held in common among examiners, the more rife with inconsistency their work will be.¹⁸

The description in the preceding paragraph is careful to avoid using the term “match.” Though employed with decreasing frequency, that word is still in wide use and is unexpectedly troublesome. The term has multiple meanings in the forensic context, which are easily conflated. The term risks misleading factfinders into believing the expert’s conclusion is more certain than pattern-matching conclusions can be.

One meaning has to do with observation. It says that the questioned and the known images share many similar features. This observation is almost never (and perhaps literally never) that the two images are identical, or indistinguishably alike. Differences are always present in all forensic pattern matching. Part of the examiner’s task is to try to decide which differences can safely be disregarded as unimportant and which similarities are of significance. Here, one might say, “they

¹⁸ Research, described *infra*, suggests a high degree of inter-examiner inconsistency among bitemark examiners.

match” – if that statement simply means that the questioned and the known are highly similar in appearance.

A second meaning has to do with inference. The examiner’s ultimate goal is to try to infer whether the questioned and the known “share a common source.” Did the finger that made the file print make the latent print? Did the gun that fired the crime scene bullet fire the test bullet? In line with this meaning, one would like to say, “it’s a match” – that is, the one and only source of the crime scene evidence has been identified.

Such a conclusion can never be reached in more than a probabilistic sense, and for that reason the assertion of a “match” to mean a definite inference of common source is misleading. It is impossible to know how many other sources could have made marks as similar to the crime scene mark as the one under examination. The most that can justifiably be said is that the known image belongs to a pool containing an unknown number of other objects that can produce images with very similar characteristics. This is precisely why DNA typing produces “random match *probabilities*” (RMPs) rather than assertions that “the” source of the crime scene DNA has been found. The RMPs provide the best available sense of the probability that a randomly selected person’s DNA would “match” the

crime scene DNA (in addition to that of a suspect whose DNA profile has been found to “match”).¹⁹

Upon hearing an expert witness state that an assertedly scientific process has determined that the questioned and the known are “a match,” factfinders can be forgiven for mistakenly thinking the identification is more certain than it is capable of being.²⁰

A third meaning of the word “match” had been used until recently by forensic dentists. The American Board of Forensic Odontology’s²¹ official guidelines for testifying to bitemark comparison opinions approved use of the term “match” to mean: “Some concordance, some similarity, but no expression of specificity intended; generally similar but true for large percentage of population.”²²

¹⁹ To say that every object of forensic interest is unique (that they can always be distinguished from each other, or that one can never be mistaken for another), are statements of speculation, not of empirical science. As a prominent population geneticist explained, “It is impossible to prove any human characteristic to be distinct in each individual without checking every individual, which has not been done.” David J. Balding, *Weight-of-Evidence for Forensic DNA Profiles* 54 (2005).

²⁰ At the same time, when one knows enough about the distribution of object attributes in the population, and the relevant probabilities in the case at hand are known (or believed on good grounds) to be sufficiently small, it is not irrational for a decision-maker to conclude that the known and the questioned probably do share a common source.

²¹ American Board of Forensic Odontology, *Diplomates Reference Manual* (January 2013), hereinafter referred to as the ABFO.

²² *Modern Scientific Evidence* Chapter.

Upon hearing that a suspected source and a crime scene object “matched,” laypersons in one study interpreted that term to indicate the strongest linkage (even though it was intended to be the weakest linkage) of any of the terms then available to forensic dentists for expressing their sense of the association between a bitemark and a suspect’s dentition.²³ In the current ABFO Diplomates Reference Manual (2013), the term “match” has been eliminated as an acceptable term for expressing opinions about bitemark source attribution.²⁴

To avoid the misunderstandings from which the term “match” suffers, this brief tries to avoid its use as much as possible. When that is not possible, we try to use it carefully.

B. Evaluation of an Inclusion

If the decision reached by the examination process is inclusion of the suspected source, the next step is to evaluate the meaning of that inclusion. Its probativeness depends upon how many other members of the population could also have produced markings with a very similar appearance to the crime scene marks.

²³ Dawn McQuiston & Michael J. Saks, *Communicating Opinion Evidence in the Forensic Identification Sciences: Accuracy and Impact*, 59 *Hastings L.J.* 1159 (2008).

²⁴ In the current ABFO Diplomates Reference Manual (January 2013), the term “match” has been eliminated as an acceptable term for expressing an opinion about bitemark source attribution.

This evaluation is done most transparently in the methods of DNA comparison for single-source crime stains, where sampling of the relevant population has been conducted and informs examiners about the frequency of occurrence of the alleles being compared. That information allows calculation of the “random match probability” (“RMP”), that is, the probability that a random member of the population has the same DNA profile as that collected at the crime scene. The more people in the population with the same profile (the larger the RMP), the less probative is the fact of the suspected source having the same profile. The fewer people in the population who share the profile (the smaller the RMP), the more probative is the fact of the suspected source having the same profile as the crime scene DNA.

Thus, some estimate of the size of the sub-population that shares a profile with the crime scene mark is necessary to evaluate the meaning of a “match.” That is not to say it must be done just as DNA typing does it. But without some method for evaluating the meaning of a suspected source having similar appearance to the crime scene evidence, a factfinder has no way to gauge how probative that fact is, and might be misled by testimony saying only that a suspected source has been judged to “match” the crime scene mark – in whatever terms that fact might be expressed.

Because the forensic identification process is fundamentally probabilistic, absolute statements of identification are insupportable. “[T]he scientific basis is insufficient to conclude that bite mark comparisons can result in a conclusive

match.”²⁵ Thus, any opinions expressed in terms suggesting pinpoint identification – such as “identification to the exclusion of all others,” “indeed and without doubt,” “certainty,” “perfect match” – have been properly criticized by numerous authorities as exceeding what the forensic identification process is capable of.²⁶ Such extreme opinions are (now) disapproved by the ABFO as well: “Terms assuring unconditional identification of a perpetrator, or without doubt, are not sanctioned as a final conclusion.”²⁷ At the same time, in contradiction, the ABFO currently permits a conclusion that a suspect is “The Biter,” which is an expression of unconditional identification. And, prefatory to all of the currently approved conclusions,²⁸ the ABFO requires: “*All opinions stated to a reasonable degree of dental certainty.*”²⁹

Recently, a subcommittee of the National Commission on Forensic Science has proposed that the Commission issue a caution against the use of the expression,

²⁵ NAS Report , at 175.

²⁶ NAS Report (at numerous points in the Report).

²⁷ ABFO Diplomates Reference Manual (2013), at 119.

²⁸ ABFO Diplomates Reference Manual (2013), at 119.

²⁹ ABFO Diplomates Reference Manual (2013), at 119 (emphasis in original). *See also* Brandon L. Garrett & Peter J. Neufeld, *Invalid Forensic Science Testimony and Wrongful Convictions*, 95 Va. L. Rev. 1, 68 (2009) (pointing out that, despite forswearing insupportable extreme opinions, the ABFO guidelines allow “members to give conclusions expressing near certainty. Examples of the conclusions they may draw include that a bite mark matches a criminal defendant to a ‘reasonable medical certainty,’ ‘high degree of certainty,’ and ‘visual certainty with no reasonable possibility that someone else did it.’”).

“to a reasonable scientific certainty,” or its discipline-specific variants, to characterize an expert opinion: “It is the view of the National Commission on Forensic Science that the scientific community should not promote or promulgate the use of this terminology.” The National Commission on Forensic Science subcommittee explained that the expression has no scientific meaning and tends to be misleading to factfinders because it asserts certainty.³⁰

Exaggerated testimony expressing conclusions about pattern-comparison evidence – that is, testimony that exceeds what a field’s knowledge and techniques can support – led the FBI to agree to review approximately 2500 cases worked from 1972-1999 by its own microscopic hair examiners. With about half the cases reviewed, “by the FBI’s count examiners made statements exceeding the limits of science in about 90 percent of testimonies, including 34 death-penalty cases.”³¹

II. BITEMARK IDENTIFICATION IN LIGHT OF THE LOGIC OF FORENSIC IDENTIFICATION

Against the background of forensic identification more generally, the special difficulties of bitemark identification can be more readily appreciated.

³⁰ National Commission on Forensic Science, *Testimony Using the Term “Reasonable Scientific Certainty”*, U.S. Dep’t of Justice (Apr. 2013). The proposed admonition apparently is aimed at witnesses and not courts because: “The Commission recognizes the right of each court to determine admissibility standards, but expresses this view as part of its mandate to ‘develop proposed guidance concerning the intersection of forensic science and the courtroom.’”

³¹ Spencer S. Hsu, *FBI Admits Flaws in Hair Analysis Over Decades*, Wash. Post, Apr. 18, 2015.

A. The Source of the Bitemark

When trying to identify a decedent who has a full mouth of teeth by comparing those to dental records, a great deal of information is available:

The human adult dentition consists of 32 teeth, each with 5 anatomic surfaces. Thus, there are 160 dental surfaces that can contain identifying characteristics. Restorations, with varying shapes, sizes, and restorative materials, may offer numerous additional points of individuality. Moreover, the number of teeth, prostheses, decay, malposition, malrotation, peculiar shapes, root canal therapy, bone patterns, bite relationship, and oral pathology may also provide identifying characteristics.³²

But when trying to identify the source of a bitemark, only a fraction of that information is available: “[I]n the typical bite mark case, all 32 teeth cannot be compared; often only 4 to 8 are biting teeth that can be compared. See Figure 2, which presents molds of the dentition from two different people (drawn from a sample of 500) whose six front teeth are indistinguishably alike. Similarly, all five anatomic surfaces are not engaged in biting; only the edges of the front teeth come into play.”³³ Moreover, the amount of information contained in the dentition involved in creating a bitemark is far less than that contained in fingerprints, DNA, and most other forms of forensic identification. Thus, the process of bitemark identification begins with a serious disadvantage relative to other types of forensic evidence: less information from the unknown specimen with which to work.

³² FJC Reference Manual, at 104-105.

³³ FJC Reference Manual, at 106.

B. The Substrate onto Which a Bite Pattern is Transferred

The potentially identifying information contained in the teeth that create a bitemark has to be captured by the material (the substrate) into which the bite is impressed. If the image of the bitemark in skin is undependable and unstable, then examiners cannot know whether they are looking at a true picture of the dentition that created the bitemark, or a distorted picture.³⁴

In the crime context where bitemarks are found, that substrate usually is skin. Skin is a poor substrate for recording the pattern of teeth. It is far less able than the modern dental materials used in dental offices to capture and dependably retain the features of, say, a tooth being replaced by a crown. Skin is a visco-elastic material. The elastic property means that indentations left by teeth will rebound, leaving potentially no record of the three dimensional structure of the biting edges of teeth. This reduces the information that may be used for comparison. The analysis then might typically consist of comparison of a bruise to a dental model. Because a bruise consists of diffusion of blood from crushed capillaries, no precise measurements can be made for comparison.

³⁴ Under most circumstances, this distortion should lead to more false negative errors than to false positives. On the other hand, if the bitemark has not been accurately recorded in the flesh, and will not match the actual biter, it sometimes can match, or be made to match (through manipulations used to “correct” distortions), the dentition of other persons. R.G. Miller et al., *Uniqueness of the Dentition as Impressed in Human Skin: A Cadaver Model*, 54 J. Forensic Sci. 909 (2009).

To further complicate the situation, biting in the criminal context typically occurs during struggles, during which skin is stretched and contorted at the time the bitemark is created. When the skin returns to its normal shape, the resulting image of the biter's dentition can be distorted to an unknown extent. Figure 3 of this Brief illustrates what can happen when a marking is placed on skin that has been stretched and the skin then returns to its normal shape. Similarly, the position in which body parts are positioned post-mortem can change the shape of the bitemark. Figure 4 illustrates this problem with an actual bitemark on the skin of a human cadaver.

In addition, live flesh reacts to injury, becomes inflamed, changes shape, and swells as healing begins. After death, changes in the skin and flesh occur due to decomposition, animal predation, insect activity, embalming, and environmental factors as well as other processes.

The pliability, elasticity and reactivity of skin and flesh all create a major challenge for bitemark identification and set it apart from other kinds of pattern-comparison forensic identification. As the NAS Report concluded in regard to these substrate problems: "These features may severely limit the validity of forensic odontology."³⁵

³⁵ NAS Report, at 174.

C. Methods of Comparison

When a forensic dentist undertakes to compare a questioned bitemark with a suspect's dentition, numerous techniques exist and are recognized by the ABFO Guidelines, including drawing bitemark images by hand. "The issue of the multiple methods of bitemark analysis continues to thwart any attempts to standardize procedures to any sort of 'gold standard.' The use of digital methods in the superimposition of bitemark evidence appears to be increasing, although the older, more experienced forensic dentists still seem to resist the use of two dimensional computer methods."³⁶

Although there has been some research comparing techniques, finding some to be significantly better than others at facilitating the visualization of bitemark-to-dentition similarities and differences,³⁷ the Guidelines do not specify criteria under which one method might be preferred to another. And, in any event, there is no oversight, so forensic dentists are free to use whichever method they happen to be familiar with or prefer.

³⁶ Modern Scientific Evidence Chapter; *see also* NAS Report, at 174-175; ABFO Diplomates Reference Manual (2013).

³⁷ E.g., David Sweet & C. Michael Bowers, *Accuracy of Bitemark Overlays: A Comparison of Five Common Methods to Produce Exemplars from a Suspect's Dentition*, 43 J. Forensic Sci. 362 (1998) (finding differences in accuracy as a function of method and recommending that forensic dentists cease using hand drawings of a suspect's teeth and increased use of digital images of dental characteristics).

Nor has the field of forensic odontology developed inclusion/exclusion criteria. Each examiner is left to form his or her own judgment about which features of the bitemark to compare and whether to declare a (suspected) bitemark and a suspect's dentition to be so similar that the examiner should declare an inclusion. Absent from bitemark analysis are "precise and objective criteria for declaring matches," considered to be essential elements of any field of forensic identification.³⁸

D. Lack of Data on Population Frequencies

To this point, we have addressed potentially insurmountable difficulties in bitemark identification that involve nothing more than the seemingly straightforward task of comparing a questioned bitemark to a suspect's dentition. Assume, however, an optimal case: sufficient information from source dentition exists and has been impressed upon a stable substrate on a victim's body; that sound methods have been employed to visualize and compare the bitemark on the victim and a suspect's dentition; that valid criteria have been developed for deciding when to include and when to exclude dentition as a possible source; and that a forensic dentist has reached a justifiable conclusion that the images were sufficiently similar to include. The next step would be to assess what that decision

³⁸ Eric S. Lander, *Fix the Flaws in Forensic Science*, N.Y. Times, Apr. 21, 2015 (arguing "[n]o expert should be permitted to testify without showing three things: a public database of patterns from many representative samples; precise and objective criteria for declaring matches; and peer-reviewed published studies that validate the methods").

can tell a factfinder about the likelihood that the suspected person's dentition did in fact produce the bitemark. As discussed earlier, such an evaluation depends upon estimating the frequency of similar patterns in the relevant population.

Unfortunately, forensic dentists have very little information of the kind needed to make an informed assessment. "If a bite mark is compared to a dental cast using the guidelines of the ABFO, and the suspect providing the dental cast cannot be eliminated as a person who could have made the bite, there is no established science indicating what percentage of the population or subgroup of the population could also have produced the bite."³⁹ Actual probabilities are not known because no population studies have been carried out to determine what features to consider, much less the actual degree of variation in teeth shapes, sizes, positions, etc., that exist in the population.⁴⁰ Work to remedy this shortcoming is at an early stage.⁴¹

Recent studies, however, have cast light on the risk of erroneously calling similar dentitions a "match" by establishing "match" rates among dental populations using methods of measurement resolution that are better than can

³⁹ NAS Report, at 174.

⁴⁰ *Id.*

⁴¹ L. Thomas Johnson et al., *Quantification of the Individual Characteristics of the Human Dentition*, 59 J. Forensic Identification 609 (2009) (reporting one original study, observing that, "Very few studies have been published on the quantification of dental characteristics," and noting that, "Expansion of the sample size through collaboration with other academic researchers will be necessary to be able to quantify the occurrence of these characteristics in the general population.").

possibly be achieved with marks on skin. In these studies, a “match” was defined as specimens that could not be determined as distinguishable within measurement error.⁴² A fundamental conclusion from these studies was that as any database of dental arrangement increases in size, the probability of one dental arrangement matching another one increases. This was especially true in analysis of orthodontically treated dentitions, in which dental arrangements are purposely made homologous.⁴³ The latest of these studies (n=1099) documented the most common patterns of dental mal-alignment three-dimensionally in a large population. This study also found that the effect of increasing distortion (reducing measurement resolution) was that dramatically larger numbers of dentitions “matched.”⁴⁴ In short, these recent studies indicate that, given relatively large numbers of people with seemingly unusual mis-alignments of teeth, compared

⁴² Mary A. Bush et al., *Statistical Evidence for the Similarity of the Human Dentition*, 56 J. Forensic Sci. 118 (2011); H.D. Sheets et al., *Dental Shape Match Rates in Selected and Orthodontically Treated Populations in New York State: A Two Dimensional Study*, 56 J. Forensic Sci. 621 (2011); Mary A. Bush et al., *Similarity and Match Rates of the Human Dentition In 3 Dimensions: Relevance to Bitemark Analysis*, 125 Int'l J. Leg. Med. 779 (2011); H.D. Sheets et al., *Patterns of Variation and Match Rates of the Anterior Biting Dentition: Characteristics of a Database of 3D Scanned Dentitions*, 58 J. Forensic Sci. 60 (2013). Measurement error, and thus the resolution of measurement of the dental arrangement, was quantified by repeated measurements of the same specimen, followed by analysis of the scatter of the measurement points. Resolution was determined to be 120 microns, or slightly more than one tenth of a millimeter.

⁴³ Sheets et al., *Dental Shape Match Rates*, *supra* note 42.

⁴⁴ Sheets et al., *Patterns of Variation*, *supra* note 42.

using the relatively poor resolution of teethmarks on skin, the risk of false positive errors is quite real.

In the absence of data concerning population frequencies of dental characteristics, how have forensic dentists assessed the value of an inclusion? One way has been to speculate or guesstimate about the population frequencies of the characteristics of biting teeth. A forensic dentist might judge a bitemark to have been made by a pattern of teeth that seems unusual in his or her experience. On occasion, a source's teeth are so unusual that they are obvious outliers; then, when a suspect's teeth are deemed closely similar (a well-defined bitemark, impressed into a stable substrate), the probability is smaller that a different person will have produced the bitemark.⁴⁵ Nevertheless, a forensic dentist's placing too much faith in the apparent unusualness of a source dentition has led to known erroneous convictions. There is no escaping the fact that forensic identification is an essentially probabilistic endeavor. For the great majority of bitemarks, however, population frequencies will necessarily be higher than in the very unusual cases, and the risk of erroneous identification greater.⁴⁶

⁴⁵ See Gerald L. Vale et al., *Unusual Three-Dimensional Bite Mark Evidence in a Homicide Case*, 21 J. Forensic Sci. 642 (1976).

⁴⁶ The high error rates for bitemark identification, described *infra*, likely are in part caused by a tendency toward under-guesstimation by forensic dentists of the probability that multiple members of a population will match a questioned bitemark.

E. Uniqueness

The conventional solution to the problem of assessing the meaning of a “match” has been to assume uniqueness. “Identification of a suspect by matching his or her dentition with a bite mark found on the victim of a crime rests on the theory that each person’s dentition is unique.”⁴⁷ But as the uniqueness assumption has increasingly come to be recognized as unproved and unsound, it also has ceased to serve as a viable solution to the problem of how to evaluate the meaning of a high degree of similarity between a bitemark and a suspect’s dentition.

Two different concepts are expressed by the notion of bitemark “uniqueness.”⁴⁸ One is the claim that no two dentitions duplicate one another in absolutely every respect. This has been termed “mere uniqueness.” An even stronger claim is being made by forensic dentistry: not only that all dentitions are unique, but also that every bitemark produced by those dentitions can be associated only with themselves and not with any other dentition. If this claim were true, it would indeed be possible to conclude that a dentition found consistent with a mark is the source of that mark. But we know from the substrate problems described, above, and from systematic empirical research as well as observations

⁴⁷ FJC Reference Manual, at 104.

⁴⁸ Simon A. Cole, *Forensics without Uniqueness, Conclusions without Individualization: The New Epistemology of Forensic Identification*, 8 *Law, Probability and Risk* 233 (2009).

by practicing forensic dentists, that repeated bites by the a single set of dentition produces very different bite markings.

The advantage of adopting and asserting the assumption of uniqueness is that it obviates the need to collect, analyze, and employ information about the population distribution of dentitions and bitemark characteristics. Much of the hard work of empirical research can be dispensed with. If no two dentitions belonging to different persons can possibly produce bitemarks that are indistinguishably alike or confusingly similar, then a judgment that a questioned bitemark looks much like a suspect's dentition is assumed to mean that the suspect is *the* source of the bitemark, not merely a member of a pool containing some unknown number of possible contributors.

The problem with the assumption of uniqueness is that it is nothing more than *ipse dixit*. The NAS Report on forensic science stated: "No thorough study has been conducted of large populations to establish the uniqueness of bite marks; theoretical studies promoting the uniqueness theory include more teeth than are seen in most bite marks submitted for comparison. There is no central repository of bite marks and patterns. Most comparisons are made between the bite mark and dental casts of an individual or individuals of interest. Rarely are comparisons made between the bite mark and a number of models from other individuals in addition to those of the individual in question."⁴⁹ In sum, "The committee received

⁴⁹ NAS Report, at 174.

no evidence of an existing scientific basis for identifying an individual to the exclusion of all others.”⁵⁰

A recent review sought to examine all empirical research aimed at determining whether all human dentition is unique.⁵¹ Following an extensive bibliographic database search, 13 studies were found and each was reviewed in detail. None was able to support a conclusion of dental uniqueness. Nine of the studies explicitly failed to find uniqueness. Four claimed to have succeeded, but were found to be methodologically incapable of supporting the asserted conclusions. Four additional studies⁵² found specimens in the study populations that were indistinguishable within measurement resolution – that is, their differences did not exceed the margin of error for the study population.

These findings bring the notion of dental uniqueness, central to bitemark analysis, into considerable doubt. As the assumption of uniqueness fades away, so does the claim that bitemark comparison can dependably link a bitemark to its source.

In light of these developments, the ABFO has recently backed away from the theory of uniqueness and the associated notion of identification-to-the-

⁵⁰ NAS Report, at 176.

⁵¹ Franco et al., *supra* note 2.

⁵² *See supra*, note 42.

exclusion-of-all-others.⁵³ The ABFO has gone so far as to suggest that any attempt to narrow identification to a single individual has to be limited to cases involving “closed populations” – that is, cases in which only a small number of known persons could have been in a position to inflict the questioned bite. Forensic dentists then need only distinguish among the dentition of a handful of known people, not speculate about tens of millions of unknown dentitions.⁵⁴

III. HOW ACCURATE ARE BITEMARK IDENTIFICATIONS?

The empirical research described in this section is noteworthy, first, for how little of it there is and, second, for how much of what does exist refutes the claims of forensic dentists regarding their ability to identify the source of a bitemark.

A. Measuring Error - Generally

In the context under discussion, decision error consists of two distinct types: a *false positive*, which is a decision that a bitemark came from a specific set of teeth when in fact it was made by other teeth. And a *false negative*, a decision that

⁵³ The most recent editions of the ABFO Diplomates Reference Manual state that the identification of a single biter from an open population of possible biters is no longer sanctioned.

⁵⁴ Even here, the rhetoric has again gotten ahead of any empirical research on the issues involved. Moreover, if investigators are mistaken about access being limited to all but the identified suspects, then we are back to an open population, only we don't know it. Furthermore, even the “closed population” approach does not preclude errors of erroneously identifying an innocent suspect as the perpetrator. See the Gordon Hay case in Scotland. Case review presented at the 2000 meeting of the Forensic Science Society by Dr. Allan Jamieson.

a bitemark did not come from a specific set of teeth, when in fact it did. However the forensic comparisons are reported – “match,” “consistent with,” “cannot exclude” – the opinions would all be classified as false positives if the “ground truth” is that the bitemark did not actually come from the teeth of the suspect.⁵⁵

False negative errors could occur for many reasons – some pertaining to the circumstances of the bite and the substrate receiving the bite, some pertaining to the medium the examiner is using to visualize the questioned and known patterns (e.g., photographs under different lighting conditions), others pertaining to the decision-making machinery of the examiners. Careful research would need to be designed in order to isolate the various possible causes of the errors and to try to develop ways to reduce errors stemming from those causes. Similarly, false positive errors could occur for a variety of reasons, pertaining to different aspects of the bite sources, tools for and conditions of visualizing the bitemarks, or the perceptual and decision characteristics of examiners.

Although the terms *reliability* and *validity* often are used interchangeably by laypersons, it is useful to maintain the distinction used by scientists and statisticians.⁵⁶ Scientists and statisticians distinguish between and separately

⁵⁵ This approach to “accuracy” comes from the field of signal detection theory. Propounded in the 1960s in such works as D.M. Green and John A. Swets, *Signal Detection Theory and Psychophysics*, Vol. 1 (1966).

⁵⁶ See *Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579, 590 n.9 (1993) (discussing the distinction and stating, “In a case involving scientific evidence,

measure reliability and validity. *Reliability* is the extent to which a measuring instrument (including human examiners) produces the same results again and again when it measures the same thing repeatedly. Intra-examiner (or within-examiner) unreliability refers to the same examiner giving different answers on different occasions when examining the very same evidence. Inter-examiner (or between-examiner) unreliability refers to different examiners examining the same evidence and reaching different conclusions about it.

Reliability concerns only consistency of measurement. It does not address whether a measurement is correct. *Validity* is concerned with the question of whether a measuring instrument (including the judgments, decisions, and opinions of humans) is generating correct answers. Five forensic dentists might all agree on whether or not a suspect's dentition made a bitemark (high reliability), but they might all be incorrect (low validity).⁵⁷

B. Recent Research on Reliability

The ABFO recently sponsored and conducted a reliability study of the judgments of experienced, board-certified forensic dentists making very basic

evidentiary reliability will be based upon *scientific validity*.”) (emphasis in original).

⁵⁷ This is not a fanciful illustration. In the 1984 Forensic Sciences Foundation handwriting proficiency test of handwriting experts, all of the examiners taking the test independently reached the same conclusion that a particular writer was not the author of a particular questioned document (100% reliability), but they were all incorrect (0% validity). Summarized in D. Michael Risinger, *Handwriting Identification, in Modern Scientific Evidence: The Law and Science of Expert Testimony* (David L. Faigman et al. eds. 2013).

decisions about bitemarks.⁵⁸ The researchers selected 100 photographs of suspect bitemark injuries from actual cases. These were examined by 38 ABFO-certified forensic odontologists having an average of 20 years' experience in bitemark identification.

The 38 examiners were asked to review the injuries in each of the 100 photographs and respond to three very basic questions. As will become apparent, the greater the degree of agreement among the examiners, the more reliability is indicated (that is, repeatability of judgments by different examiners), and the lower the rate of agreement, the less reliable their judgments are. No one can know which answers were right or wrong (that is, this was not a test of validity). We can know only the extent to which they agreed or disagreed with each other.

Question 1: Is there sufficient evidence in the presented materials to render an opinion on whether the patterned injury is a human bite mark? Findings: For only four of the 100 cases did all examiners agree on whether an opinion could be reached on whether an injury was a bitemark or not. For half of the cases there

⁵⁸ These results were presented at the annual meeting of the 2015 American Academy of Forensic Sciences, held in Orlando, Florida, in February. ABFO officials have indicated that they do not wish the results published until further research has been conducted. However, the researchers supplied the raw data to a number of people, and we draw from their descriptions of it. The one published description is found in Radley Balko's *A Bite Mark Matching Advocacy Group Just Conducted a Study that Discredits Bite Mark Evidence*, Wash. Post, Apr. 8, 2015.

was less than 71% agreement. For one quarter of the cases there was less than 47% agreement.

Question 2. Is it a human bite mark, not a human bite mark, or suggestive of a human bite mark? Findings: In about a quarter of the cases, fewer than half of the examiners agreed on whether the injury was or was not a bitemark. In 71 of the 100 cases, fewer than 70% agreed on whether the injury was a bitemark.

Question 3. Does the bite mark have distinct, identifiable arches and individual tooth marks?

By the time they reached Question 3, the examiners were already widely divided from each other in their opinions. Those who did not think the injury photograph contained enough information to make a decision did not opine on whether it was or was not a bitemark. Those who did not think the injury was a human bitemark would not be addressing whether individual tooth marks were identifiable.

Taking all three questions together, for just under half of the cases, half or fewer of the examiners agreed on the same trio of responses. For only 14 of the 100 cases did at least 80% of the examiners agree on the trio of responses.

Although no one knows which answers of which examiners were correct or not (the validity question), one can be sure that many answers were incorrect since contradictory answers cannot all be correct. The reliability of a measuring instrument sets an upper limit on its possible validity.

The study just described suggests that on this earliest threshold issue – before any of the other difficulties of bitemark *comparison* have to be confronted – bitemark analysis has not been shown to be reliable (let alone valid). Put simply, if dental examiners cannot agree on whether or not there is enough information in an injury to determine whether it is a bitemark, and cannot agree on whether or not a wound is a bitemark, then there is nothing more they can be relied upon to say. Unless and until they can do this threshold task dependably, there is no other aspect of bitemark identification that can be counted upon to produce dependable conclusions.

C. Studies of Forensic Dentists' Accuracy in Simulated Bitemark Lineups

Over the approximately four decades in which forensic dentists have been testifying in courts claiming the ability to accurately identify the individuals who were the sources of bitemarks, remarkably few tests have been carried out to assess their accuracy. While there have been hundreds of studies of eyewitness accuracy, and many dozens of proficiency tests of forensic examiners in other fields, forensic dentists have been tested only a handful of times.

Such tests as exist present practitioners with bitemarks to compare under circumstances where those conducting the study know which answers are correct and which are incorrect.

The earliest of these tests were conducted in the mid-1970s by forensic dentist David Whittaker.⁵⁹ Exemplar bites were made on pigskin. Note that pigskin is a more stable material for recording and retaining a bitemark than living human skin, so that tests using pigskin as the substrate would likely overstate the accuracy obtained by bitemark examiners. Incorrect identifications of the bites made in the Whittaker study ranged from 24% under ideal conditions to 91% when identifications were made from photographs taken 24 hours after the bites were made (which is more typical of how bitemark comparisons are done). Whittaker commented that, “the inability of examiners to correctly identify bitemarks in skin ... under *ideal* laboratory conditions and when examined immediately after biting suggests that under sometimes adverse conditions found in an actual forensic investigation it is unlikely that a greater degree of accuracy will be achieved.”

The ABFO conducted several “workshops” in which forensic dentists could test their identification skills. Only the 1999 workshop results have been made public. In that test, “All 95 board certified diplomates of the American Board of Forensic Odontology were eligible to participate in the study. Of the 60 diplomates who requested and were sent the study material, 26 returned the

⁵⁹ David K. Whittaker, *Some Laboratory Studies on the Accuracy of Bite Mark Comparison*, 25 Int’l Dent. J. 166 (1975).

necessary data by the deadline [six months after receiving the test materials] and were included in the data results.”⁶⁰

All four of the “questioned” bites were made by biters whose identity was known. Three consisted of materials from actual cases (in which the biter’s identity was established by independent means), and the fourth was a bite into cheese. Each of those bitemarks was compared to what in effect was a lineup of seven bites. Overall, examiners were in error on nearly half of their responses, more of those being false positive errors (identifying a non-biter as being the biter) than false negatives (failing to identify the actual biter).⁶¹

In 2001, in the course of evaluating digital overlays as a technique for comparing known and questioned bitemarks, forensic dentists Iain Pretty and David Sweet observed levels of error by examiners that troubled them: “While the

⁶⁰ Our description of the study and its findings is taken from the Modern Scientific Evidence Chapter on bitemark identification.

⁶¹ Out of a possible maximum error rate of 27%, examiners had a median overall error rate of 12.5%, for an error rate that in effect was 46%. Forensic dentist Michael Bowers, in Modern Scientific Evidence Chapter, explains why caution is needed in counting errors in such tests:

Once one set of dentition is linked (correctly or incorrectly) to a bitemark, the others are not linked, and therefore are scored as “correct.” In other words, given the test design, an examiner could never make more than two mistakes, and all remaining dentitions are scored as “correct.” If instead of providing a set of seven dentitions from which to choose, there had been 100, then the overall accuracy rate, using this seemingly straightforward method of counting, could never be lower than 98% correct—one false positive inculpation of an innocent suspect, one overlooked guilty suspect, and 98 remaining dentitions that get scored as “correct.” And, thus, the poorest possible performance would be “2% error.”

overall effectiveness of overlays has been established, the variation in individual performance of odontologists is of concern.”⁶² Using board-certified forensic dentists to evaluate the test bitemarks (made in pigskin), the study found that intra-examiner agreement (agreement with one’s own prior judgments given three months earlier) ranged as low as 65%. False positive responses (affirmatively linking a bite to a person who had not made the bite) averaged 15.9% (and ran as high as 45.5%) while false negatives (failing to link a bite to the person who actually made it) averaged 25.0% (and ran as high as 71.4%).

Blackwell and colleagues in 2007 examined forensic dentists’ analyses of bitemarks using 3D imaging and quantitative comparisons between human dentitions and simulated bitemarks, with the bitemarks recorded in acrylic dental wax – a far better substrate for bitemark comparisons than human skin – and false positive error rates still ran as high as 15%.⁶³

D. Studies of Bitemarks in a Cadaver Model

Another line of simulation research sought to understand the “accuracy” of skin as a substrate for recording bitemarks. Mary and Peter Bush of the School of Dental Medicine at the State University of New York at Buffalo, along with

⁶² Iain A. Pretty & David J. Sweet, *Digital Bitemark Overlays—An Analysis of Effectiveness*, 46 J. Forensic Sci. 1385 (2001) (cautioning that the “[p]oor performance” is a cause of concern because of its “very serious implications for the accused, the discipline, and society,” at 1390).

⁶³ S. Blackwell et al., *3-D Imaging and Quantitative Comparison of Human Dentitions and Simulated Bite Marks*, 121 Int’l J. Legal Med. 9 (2007).

statistician David Sheets, have produced an extensive body of research.⁶⁴ They obtained access to a reliable supply of fresh cadavers. They designed a biting machine to inflict bites that could be fitted with various cast dentitions from their reference collection, and proceeded to apply multiple bites from the same and different dentitions to different areas of cadaveric skin. They then analyzed the resulting bitemarks and compared them to the dentitions in their collection, using digitized modeling and various statistical techniques.

The first major finding was that, due to the anisotropic⁶⁵ properties of skin, no two bitemarks inflicted by the same dentition appeared the same.⁶⁶ If bitemarks

⁶⁴ Mary A. Bush et al., *Biomechanical Factors in Human Dermal Bitemarks in a Cadaver Model*, 54 J. Forensic Sci. 167 (2009); R.G. Miller et al., *Uniqueness of the Dentition as Impressed in Human Skin: A Cadaver Model*, 54 J. Forensic Sci. 909 (2009); Mary A. Bush et al., *The Response of Skin to Applied Stress: Investigation of Bitemark Distortion in a Cadaver Model*, 55 J. Forensic Sci. 71 (2010); Mary A. Bush et al., *Inquiry into the Scientific Basis For Bitemark Profiling and Arbitrary Distortion Compensation*, 55 J. Forensic Sci. 976 (2010); H.D. Sheets & Mary A. Bush, *Mathematical Matching of a Dentition to Bitemarks: Use and Evaluation of Affine Methods*, 207 Forensic Sci. Int'l 111 (2011); Mary A. Bush et al., *A Study of Multiple Bitemarks Inflicted in Human Skin by a Single Dentition Using Geometric Morphometric Analysis*, 211 Forensic Sci. Int'l 1 (2011); H. Holtkoetter et al., *Transfer of Dental Patterns to Human Skin*, 228 Forensic Sci. Int'l 61 (2013). These were the first studies in the bitemark field to investigate and summarize the biomechanical and structural properties of skin, including the J-shaped curve that describes the stress-strain relationship.

⁶⁵ To have physical properties that are different in different directions.

⁶⁶ The same conclusion was expressed recently by two prominent bitemark practitioners testifying about their casework: Frank Wright, testifying in *State v. Prade*, No. CR 1998-02-0463, 2013 WL 658266 (Ohio Com. Pl. Jan. 29, 2013), *rev'd* 2014-Ohio-1035, 9 N.E.3d 1072 (“No two bitemarks that I’ve ever seen from the same biter on the same victim look the same.”) David Senn, testifying

are not reproducible, then doubt increases about the evidentiary reliability of bitemark analysis. Both the biomechanical properties of human skin and the way it reacts to biting result in marks that often can be seen and characterized as fitting multiple different sets of dentition even within the researchers' rather small reference sample (measured in the hundreds). The *apparently* "matching" dentitions frequently did not include the dentition that actually did the biting, and the *actually* "matching" dentitions frequently were not similar to each other.

These findings suggest that accurate source attributions (that is, determining which dentition made which bite), is likely to require the bites to have been in more stable substrates (such as wax or cheese). The degree of distortion found in the marks on skin was such that even large variations in tooth arrangements did not faithfully transfer, making profiling (prediction of dental characteristics) unreliable. In addition, the level of distortion was often far above the measurement resolution of dental shapes (discussed above), allowing a potential "match" of numerous dentitions in any given population.

To better understand the implications of this line of work, it is helpful to keep in mind the range of possible substrates. At one extreme is the kind of material used in dental offices to create molds of patients' dentition. That material is designed to receive and hold impressions of teeth with a high degree of accuracy

in *New York v. Dean*, 04555 CR2007 (N.Y. Sup.Ct., June 12, 2012) ("They are surprised... when the same teeth make bitemarks and they all look different, well we've known that forever."). (Transcripts on file with author.)

and stability. There is nothing better for the purpose. At the other extreme are elastic and unstable substances that cannot capture details and that subsequently change shape, distorting the tooth impression as they do. Skin, as a substrate, is closer to the latter extreme. The research described above used cadavers. Because the skin of cadavers lacks the vital response, and does not undergo the changes caused by inflammatory reactions – while most bitemarks encountered by courts have been imposed on living victims – it is important to appreciate that the substrate used in the research is more stable, closer to the dental office material end of the spectrum than living flesh is. Consequently, the research is more conservative in that by employing a more stable substrate it obtained *more accurate* impressions than can be found in criminally inflicted bites. Moreover, it did so under more controlled conditions, preventing the distortion and slippage due to movement that occurs in a criminal struggle. Put simply, if the research found worrisome levels of variability in bitemarks and erroneous “matches,” then bites from actual criminal cases will suffer from more extreme imperfections and be that much more prone to error.

E. Conclusion and Implications

For many years, concerns about the difficulty of linking bitemarks on the skin of crime victims to their source prevented forensic dentists from offering such identification opinions to courts. The research described above underscores the wisdom of that earlier caution.

Before 1974, forensic dentists limited their work to identifying victims of mass disasters. They refrained from trying to identify the source of bitemarks on the skin of crime victims because the challenges of identifying the source a bitemark seemed to them prohibitively daunting. “The two tasks differ in important ways. In the disaster situation, there is a finite number of candidates to identify, and full dentition often is available from the victims as well as from the dental charts. In forensic bitemark cases, the number of potential suspects is huge, the bitemarks include only a limited portion of the dentition, and flesh is a far less clear medium than having the teeth (of the disaster victim) themselves.”⁶⁷ Crime scene bitemarks contain only a fraction of the information available from the full dentition of mass disaster victims, and the limited dental information that is available is neither clear (because flesh is a poor medium for recording bitemarks) nor dependably accurate (because of the elasticity of flesh and the distortion to which it is subject at the time of and after receiving the bite).

A single case became the exception that swallowed the rule. In *People v. Marx*⁶⁸ three forensic dentists saw what they regarded as a rare exception to the

⁶⁷ Modern Scientific Evidence Chapter, Sec. 37:1, note 2.

⁶⁸ 54 Cal. App. 3d 100 (1975). *Marx* was decided under California’s version of *Frye v. United States*, 293 F. 1013, 1014 (D.C. Cir. 1923), which remains California law. Recently, however, the California Supreme Court incorporated a *Daubert*-style analysis into California jurisprudence in *Sargon v. University of Southern California*, 55 Cal. 4th 747 (2012). See also David L. Faigman & Edward J. Imwinkelried, *Wading into the Daubert Tide: Sargon Enterprises, Inc. v. University of Southern California*, 64 Hastings L.J. 1665 (2013).

then generally accepted rule among forensic dentists that crime scene bitemarks could not be trusted to yield accurate source identifications. The three dentists took pains to note that in many other cases they had refused to opine on the source of crime scene bitemarks (for the reasons described above). But this case, they felt, was a rare exception to the general rule. The teeth that made the bitemark were highly unusual. The bitemark was exceptionally well defined and three-dimensional because it was in cartilage, not the soft tissue of other body areas where bitemarks usually are found. The forensic dentists characterized these bite impressions as the clearest they had ever seen, either personally or in the literature.⁶⁹

Marx became the paradoxical seed from which most, and perhaps all, subsequent decisions about admissibility of bitemark expert testimony grew. Although the experts in *Marx* agreed to testify only because they regarded its facts as a rare exception to the field's general belief that accurate source identification was not possible using bitemarks in flesh – and the court of appeals in *Marx* affirmed admission because of that rarity – subsequent cases ignored that critical distinction. *Marx* was used to support the far more general proposition that typical bitemarks in typical flesh could typically be associated with their sources with a high degree of accuracy. *Marx* came to stand for the very empirical proposition

⁶⁹ Gerald L. Vale et al., *Unusual Three-Dimensional Bite Mark Evidence in a Homicide Case*, 21 J. Forensic Sci. 642 (1976).

that the experts in the case, and in their field, had up to that point in time rejected.⁷⁰

In short, the *Marx* decision transformed forensic dentistry's view of its own value to the courts. Forensic dentists had not persuaded the courts of their ability to identify the source of a bitemark; indeed, they had not even tried to do so. Rather, by expanding *Marx* far beyond the borders of its facts, and by admitting bitemark expert testimony "wholesale" and without serious scrutiny, the courts persuaded forensic dentists that what they had to offer was better than the dentists themselves had believed it to be. The wisdom of the field prior to *Marx* was wiped away.

⁷⁰ A prominent treatise on forensic scientific evidence and the law, the lead author of which was himself a former forensic scientist turned legal scholar, summarized those developments in these terms:

The wholesale acceptance, by the courts, of testimony on bite mark identification has transformed the profession. Whereas prior to 1974 the main thrust of forensic dentistry was to prove identity of persons by means of a comparison of postmortem and antemortem dental records in mass disasters, the profession has changed direction and is now heavily involved in assisting prosecutors in homicide and sex offense cases. Having received judicial approval of bite mark comparisons, there seems to be no more limit on the extent of forensic odontological conclusions.

Andre Moenssens et al., *Scientific Evidence in Civil and Criminal Cases* (4th ed. 1995), at 985.

Another commentator observed: "After *Marx* and [an Illinois case] there was little serious consideration given to bite mark foundational dependability by subsequent courts...." D. Michael Risinger, *Navigating Expert Reliability: Are Criminal Standards of Certainty Being Left on the Dock*, 64 Alb. L. Rev. 99, 138 (2000).

Today, however, the empirical research that does exist confirms the field's earlier judgment that, except in the most unusual circumstances, it lacked the ability to offer reliable and valid bitemark identifications to the courts.

IV. SUMMARY

The scientific community, and society generally, expect that before being offered to courts, and before courts grant broad and unqualified admission, the claims for a field's techniques will have been validated.⁷¹ This validation has not happened for bitemark identification. Moreover, recent reviews of the field's claims, 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 bitemarks on human skin.

A committee of the National Academy of Sciences concluded that bitemark identification testimony has been "introduced in criminal trials without any meaningful scientific validation, determination of error rates, or reliability testing...."⁷² Two leading forensic dental researchers noted that there is "a lack of

⁷¹ The scientific perspective is that a field's claims are considered valid only to the extent that they have been empirically tested, using soundly designed research, yielding results that support the claims. That is also the perspective advanced by *Daubert*, supra note 56, as well by *Frye*, supra note 68 (though less explicitly than in *Daubert*).

⁷² *Supra* note 4.

valid evidence to support many of the assumptions and assertions made by forensic dentists during bite-mark comparisons.”⁷³

The claims of forensic dentistry have for decades outrun empirical testing of those claims. Rather than confirming the field’s claims, recent research, described in this brief, has confirmed that the foundations of bitemark identification are unsound. Perhaps, in the future, research will be conducted to solve the problems that have been identified, or find that they are not susceptible of solution, or find that the problems are less serious than they appear to be. At present, however, asserted bitemark experts “have yet to establish either the validity of their approach or the accuracy of their conclusions, and the courts have been utterly ineffective in addressing this problem.”⁷⁴

⁷³ See Pretty & Sweet, *Critical Review*, *supra* note 2, at 85.

⁷⁴ NAS Report, at 53.

Figure 1. Bitemark Evidence from Trial of Arizona v. Krone.

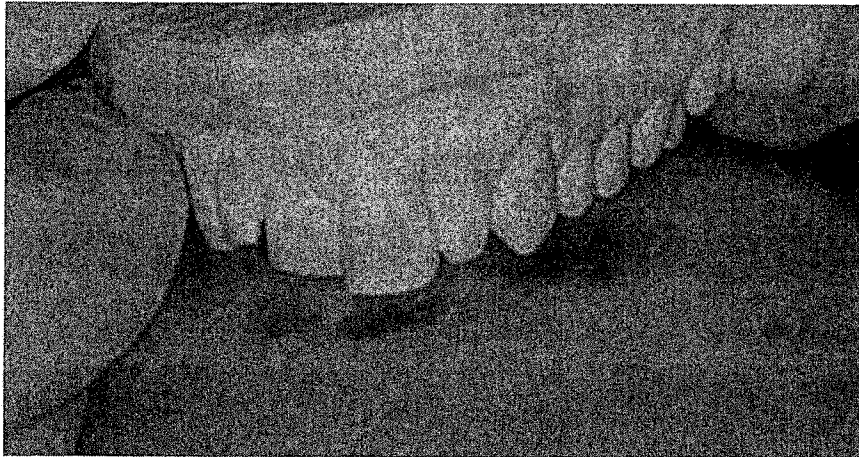


Figure 2. Indistinguishably Similar Dentition. Three-dimensional models of two different people's dentitions in which the six anterior (front) teeth were found to have the same three-dimensional shape, based on measurement error determined by repeated measurement. [From Mary A. Bush & Peter J. Bush, Current Context of Bitemark Analysis and Research, in R.B.J. Dorion (ed.), Bitemark Evidence (2d ed) (2010)]

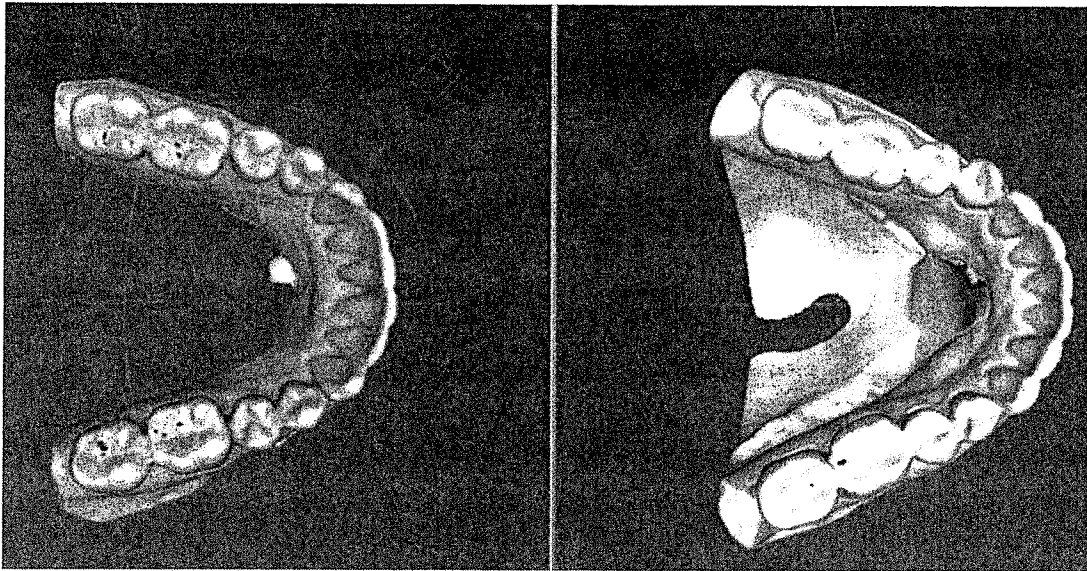


Figure 3. Two Identical Marks on Human Skin. The lower mark has been distorted by applying pressure to the area (duplicating Devore's Test). [From Bite mark Identification, Modern Scientific Evidence, Chapter 37]

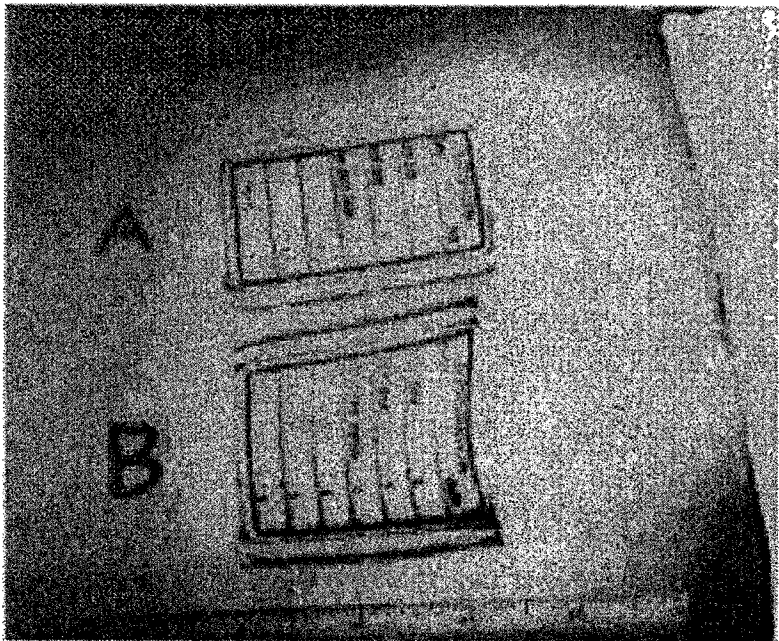
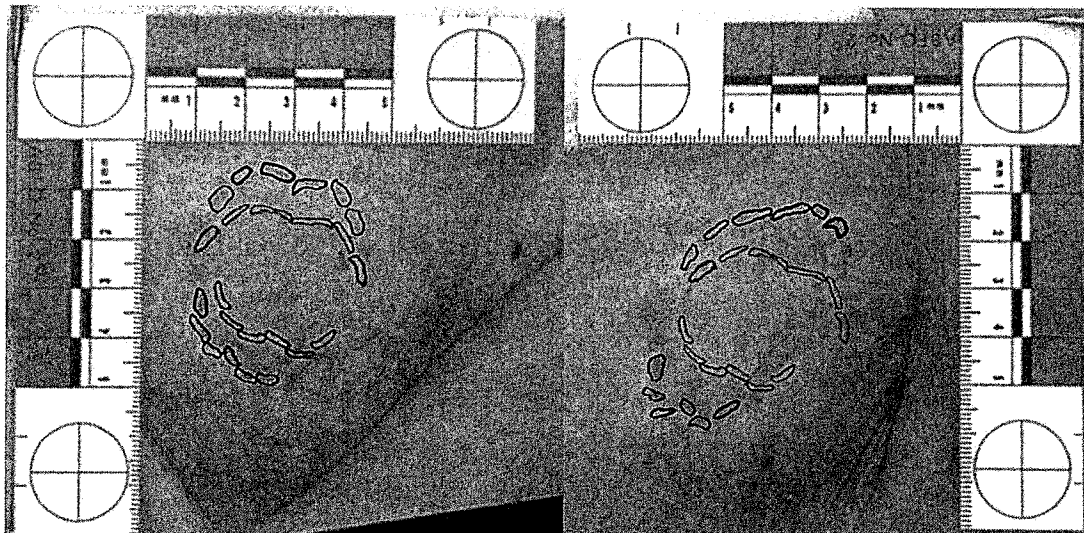


Figure 4. Changes in Bitemark Appearance Depending Upon How the Body Part is Positioned. The bite was inflicted with the arm straight at the side (left). The bitemark is outlined in black for ease of viewing; biter's overlay is in blue. Notice the alteration to the bite pattern when the arm is positioned over the head (right). [Both photos from Bush et al., 54 Journal of Forensic Sciences 167 (2009).]

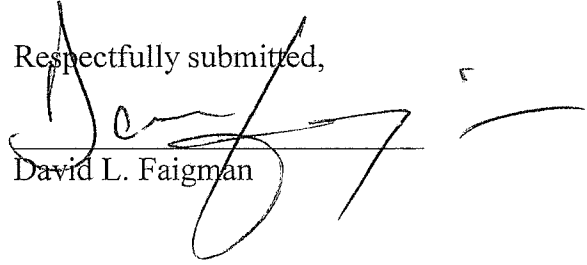


CERTIFICATE OF WORD COUNT

I, the undersigned, certify that the application consists of 5,058 words and the brief consists of 11,584 words exclusive of those portions of the brief specified in California Rule of Court 8.204(c)(3), relying on the word count of the Microsoft Word computer program used to prepare the application and brief.

Dated: June 16, 2015

Respectfully submitted,


David L. Faigman

PROOF OF SERVICE

I, the undersigned, declare as follows: I am employed in the City of San Francisco and County of San Francisco, State of California; I am over the age of eighteen years and not a party to the above entitled action; my business address is: 200 McAllister Street, San Francisco, CA 94102.

On the date indicated below, I caused the following document(s) to be served:

**APPLICATION FOR LEAVE TO FILE *AMICI CURIAE* BRIEF AND *AMICI CURIAE*
BRIEF OF MICHAEL J. SAKS, THOMAS ALBRIGHT, THOMAS L. BOHAN,
BARBARA E. BIERER AND 33 OTHER SCIENTISTS, STATISTICIANS AND LAW-
AND-SCIENCE SCHOLARS AND PRACTITIONERS IN SUPPORT OF THE PETITION
FOR WRIT OF HABEAS CORPUS BY WILLIAM JOSEPH RICHARDS**

on the following courts and parties, through their attorneys of record, named below, and addressed as follows:

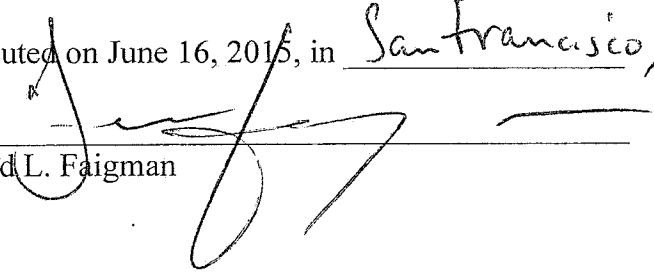
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<p>Jan Stiglitz Justin Brooks Alexander Simpson CALIFORNIA INNOCENCE PROJECT 225 Cedar Street San Diego, CA 92101 Telephone: (619) 515-1525 Facsimile: (619) 615-1425</p>	<p>Attorneys for Petitioner (1 Copy)</p>
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<p>Robert W. Fox, Warden California Medical Facility 1600 California Drive Vacaville, CA 95696 Telephone: (707) 448-6841</p>	<p>Respondent (1 Copy)</p>
<p>California Department of Corrections and Rehabilitation 1515 S Street Sacramento, CA 95811 Telephone: (916) 445-7682</p>	<p>Respondent (1 Copy)</p>

- BY HAND DELIVERY: I instructed Ace Attorney Service, Inc. to deposit the said documents to the California Supreme Court at the addresses listed above.
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- BY FEDERAL EXPRESS: I placed a true and correct copy thereof in a Federal Express (overnight) envelope addressed to the individual named above at the address shown, and by sealing and delivering the aforementioned documents to the Federal Express Drop Box at 100 Montgomery Street, San Francisco, California to be delivered by next day, on this date.
- BY PERSONAL SERVICE: I caused the said document(s) to be personally served on the attorneys identified above at the above address on this date.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed on June 16, 2015, in San Francisco, CA



David L. Faigman

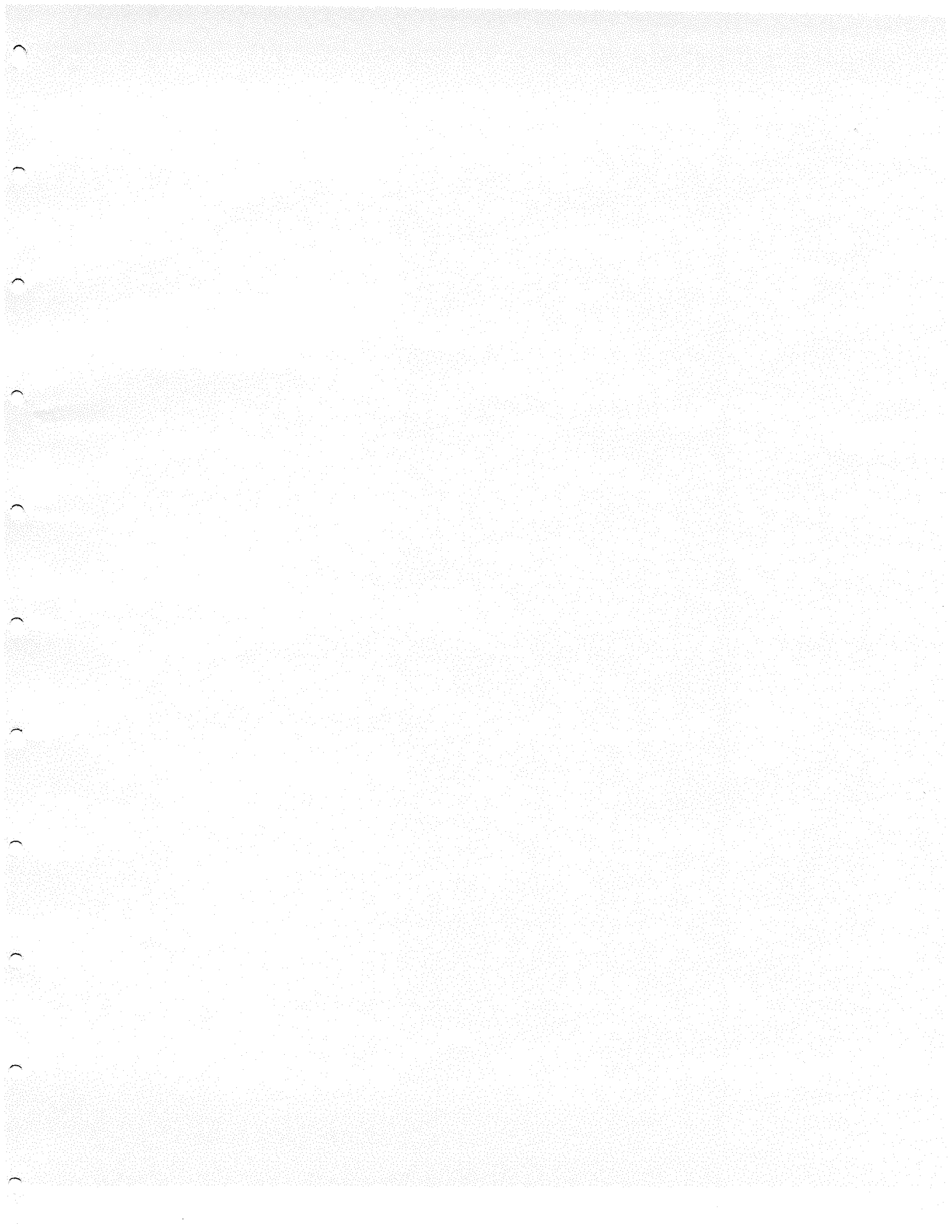


EXHIBIT F



Forensic bitemark identification: weak foundations, exaggerated claims

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ABSTRACT

Several forensic sciences, especially of the pattern-matching kind, are increasingly seen to lack the scientific foundation needed to justify continuing admission as trial evidence. Indeed, several have been abolished in the recent past. A likely next candidate for elimination is bite mark identification. A number of DNA exonerations have occurred in recent years for individuals convicted based on erroneous bite mark identifications. Intense scientific and legal scrutiny has resulted. An important National Academies review found little scientific support for the field. The Texas Forensic Science Commission recently recommended a moratorium on the admission of bite mark expert testimony. The California Supreme Court has a case before it that could start a national dismantling of forensic odontology. This article describes the (legal) basis for the rise of bite mark identification and the (scientific) basis for its impending fall. The article explains the general logic of forensic identification, the claims of bite mark identification, and reviews relevant empirical research on bite mark identification—highlighting both the lack of research and the lack of support provided by what research does exist. The rise and possible fall of bite mark identification evidence has broader implications—highlighting the weak scientific culture of forensic science and the law's difficulty in evaluating and responding to unreliable and unscientific evidence.

KEYWORDS: admissibility, bite mark, expert evidence, forensic science

INTRODUCTION

Forensic evidence used in criminal cases has never experienced greater legal and scientific scrutiny than it does today. Some types of forensic science expert testimony, particularly some of the pattern-matching subfields, have in recent years come to be recognized as standing on foundations so weak and making claims so exaggerated that the justification for admitting them as evidence in court has been called into serious

doubt. Some of those types of forensic testimony had been used for decades without any judicial concerns being raised.

The most prominent and official pronouncement of such deficiencies was given by the National Academy of Sciences' Committee on Identifying the Needs of the Forensic Science Community in its 2009 report.¹ That report concluded that "The bottom line is simple: In a number of forensic science disciplines, forensic science professionals have yet to establish either the validity of their approach or the accuracy of their conclusions..."² "Much forensic evidence including, for example, bite marks and firearm and tool mark identifications is introduced in criminal trials without any meaningful scientific validation, determination of error rates, or reliability testing..."³

Studies of wrongful convictions based on DNA exonerations have found the forensic sciences to be second only to eyewitness errors as a source of false or misleading evidence contributing to erroneous convictions.⁴ Indeed, several forensic science techniques that had for decades been welcomed into American courts are now essentially, if not entirely, dead, having been found (by scientific review committees) to lack sufficient validity to continue to be offered as evidence. The eulogy for voiceprints was given by the National Academy of Sciences in 1979,⁵ following which the FBI ceased offering such experts in support of any prosecution case in chief, and the discipline slid into decline. More recently, comparative bullet lead analysis met the same fate.⁶ And, over a continuing period, numerous 'indicators' of arson have been determined to lack any basis in empirical reality and have been laid to rest.⁷

The most likely candidate to next join those fields and techniques in the cemetery of terminated forensic sciences is forensic odontology—the comparison of suspected bite marks (usually found in the flesh of crime victims) and the dentition of suspects. The claim of forensic dentists has been that they can accurately associate a bite mark to the one and only set of teeth in the world that could have produced the crime scene bite mark. However, as this article will explain, no sound basis exists for believing that forensic dentists can perform such a feat. Despite the lack of empirical evidence to support its claims, to date no court in the United States has excluded such expert evidence for failing to meet the requisite legal standard for admission of expert testimony. Only in rare instances did judges even raise questions concerning the trustworthiness of such

¹ Committee on Identifying the Needs of the Forensic Science Community National Research Council, *Strengthening Forensic Science in the United States: A Path Forward* (2009) (hereinafter, NAS Report). The original, and parent, organization, created by Congress in 1863, during the administration of Abraham Lincoln, is the National Academy of Sciences. One of its major subunits is the National Research Council, through which 'the NAS provides objective, science-based advice on critical issues affecting the nation'. <http://www.nasonline.org> (accessed August 28, 2016).

² NAS Report, at 53.

³ *Id.* at 107, 108.

⁴ BRANDON L. GARRETT, CONVICTING THE INNOCENT: WHERE CRIMINAL PROSECUTIONS GO WRONG 84, 117 (2010); Michael J. Saks & Jonathan J. Koehler, *The Coming Paradigm Shift in Forensic Identification Science*, 309 SCIENCE 892 (2005).

⁵ National Academy of Sciences, *On the Theory and Practice of Voice Identification* (1979).

⁶ National Research Council, Committee on Scientific Assessment of Bullet Lead Elemental Composition Comparison, *Forensic Analysis: Weighing Bullet Lead Evidence* (2004).

⁷ John Lentini, *Fires, Arsons, and Explosions*, in MODERN SCIENTIFIC EVIDENCE: THE LAW AND SCIENCE OF EXPERT TESTIMONY (Faigman et al. eds, 2010).

evidence, even after errors in bitemark identifications came to light.⁸ This is beginning to change. In a series of high-profile cases, including DNA exonerations, bitemark identifications have been exposed as erroneous.⁹ The Texas Commission on Forensic Science has called for a ‘moratorium’ on the use of bitemark testimony in court and is auditing old cases that had involved the use bitemark evidence.¹⁰

Had the California Supreme Court decided a recent case more broadly than it did—holding (as it did not) that such evidence generally lacks reliability and validity—it might have started a cascade of similar exclusions in other jurisdictions.¹¹ Such an outcome could be viewed as atonement for California’s having launched bitemark identification into its decades-long status as an accepted forensic science despite its lack of any scientific (read: empirically tested) basis.

The section immediately below reviews the legal basis for admissibility of opinion testimony on identification by means of bite marks. Our focus then turns to the scientific deficiencies of bitemark expert evidence. The next section discusses the growing recognition of doubts about the claims of forensic odontology. The section following that explains the general logic of forensic identification. The section after that discusses the claims of bitemark identification against that background of general principles. The last major section focuses on studies assessing the accuracy of bitemark identification. Finally, we conclude by examining what the life cycle of the field of bitemark identification portends for forensic disciplines more broadly, and what lessons can be drawn for both the scientific and legal communities. Forensic scientists, researchers, lawyers, judges, and policymakers must all now grapple with the legacy of decades of unreliable forensics used in our courtrooms. In addition to auditing the misuse of science in the past, difficult challenges remain to ensure that judges adequately screen scientific evidence in criminal cases in the future. The story of the rise and fall of bitemark identification suggests the perils of path dependency in judicial review of scientific evidence and the terrible miscarriages of justice that can result when judges uncritically admit unvalidated expert accept into evidence. The lessons currently being learned will need to be remembered in the decades to come.

⁸ In high-profile cases, courts have even upheld convictions after DNA testing excluded the defendant, citing to the fact that a bitemark identification was made. See *eg Brewer v. State*, 819 So. 2d 1169, 1172, 1173 (Miss. 2002) (‘Dr. Michael West, the State’s expert forensic odontologist, testified that it was his opinion that the bite marks on the victim were inflicted by Brewer’). That expert did have testimony barred at a retrial in another case. See Steve Cannizaro, *Buras Man May Beat Murder Rap Second Time*, N.O. TIMES-PICAYUNE, Dec. 21, 1996 at B1. It was rare for judges to even cite to *Daubert* (*infra* note 84) in rulings discussing any challenges to bitemark evidence. D. Michael Risinger, *Navigating Expert Reliability: Are Criminal Standards of Certainty Being Left on the Dock?* 64 ALBANY L. REV. 99, 135–36 (2000).

⁹ Garrett, *supra* note 4, at 102, 105 (discussing DNA exonerations in cases of seven individuals, and how in five of those cases invalid testimony was presented in court claiming certainty that the defendant had left the marks in question).

¹⁰ The nearest any state has come to banning dental identification testimony is the Texas Commission on Forensic Science. ‘[C]oncluding that the validity of the technique has not been scientifically established’, the Commission has called for a moratorium on its use in court. Erik Eckholm, *Texas Panel Calls for an End to Criminal IDs via Bite Mark*, N. Y. TIMES, Feb. 12, 2016, <http://nyti.ms/1o879OQ> (accessed August 28, 2016). See, Texas Forensic Science Commission, *Forensic Bitemark Comparison Complaint Filed by National Innocence Project on Behalf of Steven Mark Chaney - Final Report*, Apr. 12, 2016.

¹¹ In re Richards, 63 Cal.4th 291 (2016).

LEGAL ORIGINS OF BITEMARK OPINION ADMISSIBILITY

Before 1974, forensic dentists confined themselves to trying to identify victims of natural or human-caused disasters. Frequently, those situations provided odontologists with the complete dentition of a small, well-defined set of individuals, who needed to be distinguished from each other. The method used for trying to accomplish that was to compare the victims' dentition against their dental records, which often included full-mouth X-rays.¹²

Until 1974, the discipline refrained from trying to identify the source of a bite mark left in skin because the differences between identifying victims of mass disasters and identifying the source of a crime scene bite mark seemed to them prohibitively daunting:

The two tasks differ in important ways. In the disaster situation, there is a finite number of candidates to identify, and full dentition often is available from the victims as well as from the dental charts. In forensic bitemark cases, the number of potential suspects is huge, the bitemarks include only a limited portion of the dentition, and flesh is a far less clear medium than having the teeth (of the disaster victim) themselves.¹³

Thus, crime scene bite marks contain only a small fraction of the information available from the full dentition of mass disaster victims, and the limited dental information that is available is neither clear (flesh is far from an ideal medium for recording bite marks) nor dependably accurate (flesh is elastic and subject to distortion at the time of and after receiving the bite).

The California case of *People v. Marx* (1975)¹⁴ presented what three forensic dentists, led by Gerry Vale of the UCLA School of Dentistry, thought was a justifiable exception to the rule among forensic dentists that crime scene bite marks could not be trusted to yield accurate source identifications. The *Marx* case involved a murder victim with an elliptical laceration on her nose. The laceration was judged to be a human bite; impressions were made of the wound and compared to a cast of the defendant's teeth. At trial, the three dentists testified that in their opinion the observable portion of the unknown teeth that made the wound were indistinguishably similar to the comparable teeth of the defendant. Vale took pains to note that in many other cases they had refused to opine on the source of crime scene bite marks (for the reasons described in

¹² C. Michael Bowers, *Identification from Bitemarks*, in MODERN SCIENTIFIC EVIDENCE: THE LAW AND SCIENCE OF EXPERT TESTIMONY (Faigman et al. eds, 2010).

¹³ *Id.*, Sec. 37:1, note 2.

¹⁴ 54 Cal. App. 3d 100, 126 Cal. Rptr. 350, 77 A.L.R.3d 1108 (2d Dist. 1975). An earlier case confronted the admissibility of expert testimony on a bite mark identification. *Doyle v. State*, 159 Tex. Crim. 310, 263 S.W.2d 779 (1954). This is not considered the seminal case for admission of bite mark evidence because of its peculiarities and lack of a following by courts or forensic dentists. *Doyle* was charged with burglary. At the site of the burglary was found a piece of partially eaten cheese. After arresting *Doyle*, the sheriff asked him to bite a piece of cheese, which the suspect voluntarily did. A firearms examiner compared plaster casts of the two pieces of cheese to try to determine if the questioned and the known tooth marks had been made by the same person, and agreed that they had. The Texas Court of Criminal Appeals upheld the admission of this bite mark opinion testimony. The defense in *Doyle* did not contest admissibility by raising any issue of scientific validity, but instead raised only legal procedural challenges. Thus, the *Doyle* court had no occasion to address the scientific status of bite mark identification. Nevertheless, another Texas court relied on *Doyle* 20 years later as the basis for rejecting an appellant's contention that bitemark test results were of unproven validity. *Patterson v. State*, 509 S.W.2d 857 (Tex. Crim. App. 1974).

the preceding paragraph). This case, they felt, was a rare exception to the general rule. The teeth that made the bite mark were highly unusual and the bite mark was exceptionally well defined and three dimensional (because nasal skin is stretched tautly over underlying bone and cartilage, nasal tissue is firmer than the tissue of other body parts where bite marks are found, such as breasts). The witnesses characterized these bite impressions as the clearest they had ever seen, either personally or in the literature.¹⁵

The defense challenged the admissibility of the expert testimony in *Marx* on two major grounds. First, that it was novel and not generally accepted by the field of odontology and therefore was inadmissible under California's *Kelly-Frye* test. Second, that it violated the doctrine of another California case, *People v. Collins* (1968).¹⁶ *Collins* had held that identification conclusions based on joint probability estimates are inadmissible when the individual probabilities of the underlying attributes are unknown (and therefore are being supplied only by speculation); when the attributes are not known to be independent of each other (and therefore the 'product rule' typically used to combine individual probabilities to reach a joint probability conclusion is inapplicable and produces inaccurate and exaggerated conclusions); and that when the conclusion is interpreted misleadingly to suggest a tiny (or zero) probability that someone other than the defendant could have been the perpetrator.¹⁷

The bitemark expert evidence was admitted at trial and the resulting conviction was appealed. The court of appeals turned away the first ground of attack by interpreting a technique's novelty to refer not to the novelty of the identification theory being employed, but to the tools employed to visualize the bite mark and the suspect's dentition. On that, the court opined that the experts 'applied scientifically and professionally established techniques—X-rays, models, microscopy, photography—to the solution of a particular problem which, though novel, was well within the capability of those techniques'.¹⁸

The second ground was disposed of by emphasizing that, of the forensic dentists who testified, none was 'engaged in a "trial by mathematics" [citing *Collins*] on or off the stand'. Consequently, '[t]here was no error'.¹⁹ As the court saw things, although the underlying logic of the witnesses' conclusions followed precisely the steps of reasoning prohibited by *Collins*, because the speculative data were never made explicit to a jury (but kept implicit within the experts' theory of identification) the opinions were protected from being excludable under *Collins*.²⁰

Moreover, the court thought that *Kelly-Frye* was inapplicable in *Marx*, reasoning that such a test applied only to evidence that was indecipherable without an expert's interpretation, whereas *Marx* involved models, X-rays, and slides of the victim's wounds and

¹⁵ Gerry L. Vale et al, *Unusual Three-Dimensional Bite Mark Evidence in a Homicide Case*, 21 J. FORENSIC SCI. 642 (1976).

¹⁶ 68 Cal. 2d 319, 66 Cal. Rptr. 497, 438 P.2d 33, 36 A.L.R.3d 1176 (1968).

¹⁷ That third issue is a common error that has since come to be known as 'the prosecutor's fallacy'. William C. Thompson and E.L. Schumann, *Interpretation of Statistical Evidence in Criminal Trials: The Prosecutor's Fallacy and the Defense Attorney's Fallacy*, 11 L. & HUM. BEHAV. 167 (1987).

¹⁸ *Marx*, *supra* note 14 at 111.

¹⁹ *Id.* at 113.

²⁰ Query whether keeping one's speculative (data-free) assumptions and logic quiet, rather than exposing them to the fact finder, exempts the resulting expert conclusions from the *Collins* limitation. Or is it, perhaps, an even more troubling violation of the principle?

the accused's dentition, all of which were clearly visible for the jurors to view, assess, and verify on their own during court proceedings, without having to rely on the expert odontologist as a necessary intermediary.

The most sensible, and charitable, reading of *Marx* would be that the court understood, along with the forensic dentists, that the circumstances of the injury presented an unusually stable bite mark of an apparently very unusual set of teeth. In short, the offer and the admission in *Marx* constituted a rare exception to the general rule (among forensic dentists) that bite marks were a poor basis for trying to compare patterns.

Marx became the paradoxical seed from which most, if not all, subsequent decisions about admissibility of bitemark expert testimony grew. Although the experts in *Marx* agreed to testify only because they regarded its facts as an exceedingly rare, and therefore justifiable, exception to the field's general belief that accurate source identification was not possible using bite marks in flesh, subsequent courts ignored that distinction and cited *Marx* for the far more general proposition that bite marks in flesh 'could' be associated with their sources with a high degree of accuracy. *Marx* came to stand for the very proposition that the experts in the case, and their field, had up to that point explicitly, collectively rejected.

What had been an exception to the rule magically became the rule, not only for courts but for forensic dentists as well. But, ironically, rather than forensic dentists convincing courts that their field could accurately identify the sources of bite marks, the courts convinced forensic dentists that they could do what until then they doubted they could do.

The following year, Illinois considered for the first time the issue of admissibility of bitemark evidence. Relying in part on *Marx*, in *People v. Milone* (1976), the Illinois Court of Appeals held it admissible as 'a logical extension of the accepted principle that each person's dentition is unique'.²¹ The court based this on its earlier recognition of the identification of accident victims from their dental records. The testimony of three forensic dentists was offered by the prosecution and four by the defense. The defense experts testified and cited odontological literature showing, at the least, an absence of any consensus among forensic dentists as to whether perpetrators could be identified from bites left in the flesh of victims. Notwithstanding the controversy in the trial record and in the literature, the court found that the general acceptance standard had been met. Moreover, it held that questions about the scientific soundness of the prosecution's experts' claims went to the weight of the expert testimony, not to its admissibility, and thus were questions for the jury, not for the court.²²

²¹ *People v. Milone*, 43 Ill. App. 3d 385, 2 Ill. Dec. 63, 356 N.E.2d 1350 (2d Dist. 1976).

²² Even after being paroled after serving nearly 20 years in prison for murder, Milone continued to insist upon his innocence and continued to try to clear his name. He went to federal court to challenge the original admission decision—arguing that bitemark expert evidence failed under both the Frye and Daubert standards. Furthermore, he offered evidence of another murder victim found in the same area where the victim he was accused of killing had been found. An apparent bite mark from the second murder victim was linked to a suspect, Macek. The bite marks on the two victims in the two cases were judged by at least one forensic odontologist to be indistinguishable from each other. Lowell Levine, *Forensic Dentistry: Our Most Controversial Case*, in LEGAL MEDICINE ANNUAL (Cyril Wecht ed., 1978). Macek signed (but later withdrew) a confession to having killed the victim for whose murder Milone had been convicted. Discussed in *State v. Sager*, 600 S.W.2d 541 (Mo. Ct. App. W.D. 1980). The Court of Appeals for the Seventh Circuit expressed sympathy with Milone's request, especially in light of the evidence presented of Macek, his victim, and his dentition, but declined to rule on the

By 1978, the California Court of Appeals flatly held that the testimony of three forensic odontologists established that bite mark identification had attained the required general acceptance in the relevant scientific community.²³

Daubert, despite its requirement for establishing scientific validity as a condition of admissibility, appears to have changed nothing. The two earliest post-*Daubert* cases, in federal courts, decided more than a decade after *Daubert* illustrate the difficulty courts have in focusing on the validity of the asserted forensic expertise.

In *Burke v. Town of Walpole* (2004),²⁴ the plaintiff alleged civil right violations against Massachusetts for his wrongful arrest and imprisonment, based heavily on a bite mark examination which purported to identify him as the person whose bite mark was found on the body of a murder victim. He was later exonerated by DNA typing. In the course of drafting recommended findings concerning the Commonwealth's motion to dismiss, the federal magistrate judge appeared never to doubt the validity of bite mark expertise though the best the court could do to support its faith was to cite cases that cite cases that express the same credulousness.

In *Ege v. Yukins* (2005)²⁵ in ruling on a habeas petition, the district court found the admission of bite mark expert opinion at the original trial to be so 'unreliable and grossly misleading', *id.* at 880, as to constitute a fundamental denial of due process, *id.* at 880. The defendant had been convicted of murder 9 years after the underlying crime took place and served more than 10 years of a life sentence by the time the federal court granted relief.

At the original trial, the defendant had been convicted in large part on the testimony of a forensic dentist whose opinion it was that a mark on the cheek of the victim, visible in a photograph of the corpse, was a human bite mark and that the mark matched the dentition of the defendant and no one other than the defendant. The odontologist stated that out of the 3.5 million people residing in the Detroit metropolitan area, the defendant was the only one whose dentition could match the asserted bite mark on the victim's cheek. The petitioner argued that the bite mark testimony had been improperly admitted because it lacked any scientific foundation and that the statistical probability given had an exaggerated impact on the jury. The court ruled that 'there is no question that the evidence in the case was unreliable and not worthy of consideration by a jury'.²⁶ The court's conclusion could hardly be more clear. But the court's condemnation of the bite mark testimony did not go to fundamental weaknesses of bite mark comparison; it was instead aimed at case-specific, even witness-specific, problems.

One ground for the court's concern was that the comparison was made using a photograph of the wound. What was problematic about this the court does not say.²⁷ A second factor was the court's perception that this particular expert witness was singularly incompetent: 'Dr. Warnick thoroughly has been cast into disrepute as an expert

case for lack of a constitutional basis for granting relief as well as because principles of federalism precluded a federal court from reexamining issues of fact reserved to the state court. *Milone v. Camp*, 22 F.3d 693 (7th Cir. 1994).

²³ *People v. Slone*, 76 Cal. App. 3d 611, 143 Cal. Rptr. 61 (2d Dist. 1978).

²⁴ 2004 WL 502617 (D. Mass. 2004), *aff'd* in part, vacated in part, 405 F.3d 66 (1st Cir. 2005).

²⁵ 380 F. Supp. 2d 852 (E.D. Mich. 2005), *aff'd* in part, *rev'd* in part on other grounds, 485 F.3d 364 (6th Cir. 2007).

²⁶ *Id.* at 871.

²⁷ *Id.* at 876.

witness and several convictions based on his testimony have been undermined and overturned'.²⁸ Since those troublesome cases occurred long after the trial that was the subject of habeas review, they were nothing the trial court could have known a decade earlier. The habeas court does not say what was wrong with Dr. Warnick's examinations, or if they were standard practice among forensic dentists. The final flaw found by the court was that Dr. Warnick expressed his opinion through an explicit probability value. The court goes on at some length, discussing and citing numerous cases that raise doubts about inferences based on probability estimates. What the court failed to appreciate is that all of forensic odontology relies on these same notions to reach their conclusions of identity. That Dr. Warnick expressed his conclusion by uttering a number while his brethren typically do so by asserting verbally that dentition is unique among all humans, that the defendant's dentition matches the bite mark, and therefore the defendant has to be the source of the bite mark (to the exclusion of all other possible sources). Thus, Dr. Warnick's number was less extreme and no more scientifically unjustified than the verbal formulation typically presented by forensic dentists. The court seems unaware of that.

Ege, like *Burke*, assumes the general soundness of the methods of bitemark comparison, but finds fault with the particular individual performing the comparisons. By attacking this particular witness and his particular testimony with such vigor, the court avoided placing the field's more general shortcomings under scrutiny. The problem with the expert witness seems not to be that he deviated from his discipline's generally accepted practices so much as that he followed them.

As of this writing, no court we are aware of has ever excluded or otherwise held forensic bitemark expert testimony to be inadmissible. Perhaps that is because no court has thoughtfully compared the claims of bitemark identification to the (lack of) scientific foundation for those claims. They have admitted the testimony essentially because other courts admitted it. Even a radical change in the test for admission—that is, the U.S. Supreme Court's adoption of the *Daubert* tetralogy—did not change that practice.

A treatise on forensic scientific evidence and the law, the lead author of which had been a forensic scientist before turning legal scholar, described these developments two decades later, saying:

The wholesale acceptance, by the courts, of testimony on bitemark identification has transformed the profession. Whereas prior to 1974 the main thrust of forensic dentistry was to prove identity of persons by means of a comparison of postmortem and antemortem dental records in mass disasters, the profession has changed direction and is now heavily involved in assisting prosecutors in homicide and sex offense cases. Having received judicial approval of bitemark comparisons, there seems to be no more limit on the extent of forensic odontological conclusions.²⁹

GROWING DOUBTS

Beliefs about the capacity of bitemark comparisons to accurately identify the source of a questioned bite mark have followed a trajectory from widespread skepticism through

²⁸ *Id.* at 857.

²⁹ ANDRE MOENSSSEN ET AL., *SCIENTIFIC EVIDENCE IN CIVIL AND CRIMINAL CASES* 985 (4th ed. 1995).

widespread credulity to a growing return to doubt. That growing doubt is based on the emerging realization that the field stands on a quite limited foundation of scientific fact, that there is ‘a lack of valid evidence to support many of the assumptions and assertions made by forensic dentists during bite-mark comparisons’,³⁰ and that error rates by forensic dentists are perhaps the highest of any forensic identification specialty still being practiced.³¹ Bite-mark testimony has been ‘introduced in criminal trials without any meaningful scientific validation, determination of error rates, or reliability testing...’³²

Those realizations have been taken up most prominently in the work of a committee of the National Academy of Sciences, which reviewed the scientific support for the claims of bite-mark identification, among others, and found serious deficiencies.³³ The Committee on Identifying the Needs of the Forensic Science Community was co-chaired by Judge Harry Edwards, of the U.S. Court of Appeals for the D.C. Circuit, who described the Committee’s work:

[The Committee spent] more than two years... listening to testimony from and reviewing materials published by countless experts, including forensic science practitioners, heads of public and private laboratories, directors of medical examiner and coroner offices, scientists, scholars, educators, government officials, members of the legal profession, and law enforcement officials. Not only were we trying to understand how the forensic science disciplines operate, we were also trying to determine the extent to which there is any... scientific research to support the validity and reliability of existing forensic disciplines; in particular, we were looking for scientific studies that address the level of accuracy of forensic disciplines that rely on subjective assessments of matching characteristics. We invited experts in each discipline to refer us to any such research...³⁴

The Committee completed its work and issued its report in 2009. Several observations and conclusions can be drawn from the report relevant to evaluating asserted bite-mark identification expertise, including the following.

³⁰ Iain Pretty & David Sweet, *The Scientific Basis for Human Bite Mark Analyses—A Critical Review*, 41 SCI. & J. 85, 85 (2001). See also Mary A. Bush & Peter J. Bush, *Current Context of Bite-mark Analysis and Research*, in BITE-MARK EVIDENCE: A COLOR ATLAS AND TEXT § 6-303 (Robert B.J. Dorion ed., 2010) (2d ed. 2010); Ademir Franco et al., *The Uniqueness of the Human Dentition as Forensic Evidence: A Systematic Review on the Technological Methodology*, 129 INT’L J. LEGAL MED. 1277 (Nov. 15, 2015); Iain A. Pretty & David J. Sweet, *Digital Bite-mark Overlays—An Analysis of Effectiveness*, 46 J. FORENSIC SCI. 1385 (2001); NAS Report, at 176; PAUL GIANNELLI, EDWARD J. IMWINKELRIED & JOSEPH L. PETERSON, REFERENCE GUIDE ON FORENSIC IDENTIFICATION EXPERTISE, FEDERAL JUDICIAL CENTER, REFERENCE MANUAL ON SCIENTIFIC EVIDENCE (3d ed. 2011) (hereinafter, FJC Reference Manual); C. Michael Bowers, *Identification from Bite-marks*, in MODERN SCIENTIFIC EVIDENCE: THE LAW AND SCIENCE OF EXPERT TESTIMONY (David L. Faigman et al. eds, 2014) (hereinafter, Modern Scientific Evidence Chapter).

³¹ The findings of studies testing bite mark examiners’ ability to correctly identify the source of bite marks are reviewed, *infra*. The text’s allusion to forensic techniques ‘still being practiced’ refers to several forms of forensic science (voiceprint identification, comparative bullet lead analysis, and a large number of arson ‘indicators’) that have ceased to be offered to courts following reviews by scientific bodies finding them to lack validity, though prior to those reviews they had frequently been admitted into evidence by courts.

³² NAS Report, at 108.

³³ NAS Report.

³⁴ Harry T. Edwards, *Solving the Problems that Plague the Forensic Science Community*, 50 JURIMETRICS J. 5 (2009).

Bitemark identification was seen as a field in which ‘forensic science professionals have yet to establish either the validity of their approach or the accuracy of their conclusions, and the courts have been utterly ineffective in addressing this problem’.³⁵

‘Although the majority of forensic odontologists are satisfied that bite marks can demonstrate sufficient detail for positive identification [of a perpetrator], no scientific studies support this assessment....’³⁶ ‘[T]he scientific basis is insufficient to conclude that bite mark comparisons can result in a conclusive match.’³⁷

One reason for doubts about ‘the value and scientific validity of comparing and identifying bite marks’³⁸ is the unsatisfactory nature of skin as a substrate for registration of tooth impressions: ‘Unfortunately, bite marks on the skin will change over time and can be distorted by the elasticity of the skin, the unevenness of the bite surface, and swelling and healing. These features may severely limit the validity of forensic odontology’.³⁹ This aspect of bitemark identification sets it apart from other types of forensic pattern-comparison techniques.

There is no science on the reproducibility of the different methods of analysis that lead to conclusions about the probability of a match. This includes reproducibility between experts and with the same expert over time. Even when using the guidelines, different experts provide widely differing results and a high percentage of false positive matches of bite marks using controlled comparison studies.⁴⁰

The NAS Committee recognized the work of cognitive scientists showing that, when viewing ambiguous information, the observer’s mind tends to see what the observer expects or hopes to see.⁴¹ Ambiguities are resolved as being consistent with

³⁵ NAS Report, at 53.

³⁶ *Id.* at 176.

³⁷ *Id.* at 175. Though no scientific basis exists for identifying any particular person as the one and only possible source of a bite mark, such unwarranted assertions have been common in the testimony of forensic dentists. Illustrative of many other case are the following.

In the capital rape-murder trial of Ray Krone in Arizona, two forensic dentists testified: ‘The teeth of Ray Krone did cause the injuries on the body of [the victim] to a reasonable degree of medical certainty. This represents the highest order of confidence that no other person caused the bite mark injuries’. ‘I’m certain [of the identification]’. (Figure 1 shows one of the evidence photographs from that case, comparing a mold of Krone’s dentition to a bitemark on the murder victim. Ten years after being sentenced to death, Krone was exonerated by DNA.)

At the Wisconsin trial of Robert Lee Stinson, a board-certified, ABFO diplomate concluded that the bite marks ‘had to have been made by teeth identical’ to Stinson’s, and that there was ‘no margin for error’ in his conclusion. (After 23 years in prison, Stinson was exonerated by DNA.)

At a preliminary hearing in Michigan, the forensic dentist testified that Anthony Otero was ‘the only person in the world’ who could have caused the bitemarks on the victim’s body. (A month later, DNA testing excluded Otero as the perpetrator.)

³⁸ NAS Report, at 173.

³⁹ *Id.* at 174.

⁴⁰ *Id.*

⁴¹ See D. Michael Risinger et al., *The Daubert/Kumho Implications of Observer Effects in Forensic Science: Hidden Problems of Expectation and Suggestion*, 90 CAL. L. REV. 1, 56 (2002); Itiel Dror et al., *Contextual Information Renders Experts Vulnerable to Make Erroneous Identifications*, 156 FORENSIC SCI. INT’L 74 (2006). The NAS Report called for further research regarding this problem.



Figure 1. Bite mark evidence from trial of *Arizona v Krone*.
[In public domain.]

expectations, and bite mark experts do not generally employ procedures for preventing such errors:

[F]orensic odontology suffers from the potential for large bias among bite mark experts in evaluating a specific bite mark in cases in which police agencies provide the suspects for comparison and a limited number of models from which to choose from in comparing the evidence. Bite marks often are associated with highly sensationalized and prejudicial cases, and there can be a great deal of pressure on the examining expert to match a bite mark to a suspect. Blind comparisons and the use of a second expert are not widely used.⁴²

In concluding that ‘[m]ore research is needed to confirm the fundamental basis for the science of bite mark comparison’, the NAS Report summarized ‘[s]ome of the basic problems inherent in bite mark analysis and interpretation’ as follows.

- (i) The uniqueness of the human dentition has not been scientifically established.
- (ii) The ability of the dentition, if unique, to transfer a unique pattern to human skin and the ability of the skin to maintain that uniqueness has not been scientifically established.
 - (a) The ability to analyse and interpret the scope or extent of distortion of bite mark patterns on human skin has not been demonstrated.
 - (b) The effect of distortion on different comparison techniques is not fully understood and therefore has not been quantified.
 - (c) A standard for the type, quality, and number of individual characteristics required to indicate that a bite mark has reached a threshold of evidentiary value has not been established.⁴³

THE LOGIC OF FORENSIC IDENTIFICATION—GENERALLY

Forensic identification, including bite mark identification, involves two indispensable steps.⁴⁴ The first step is to compare the crime scene markings to the possible sources of

⁴² NAS Report, at 175.

⁴³ *Id.* at 175, 176.

⁴⁴ Allan Jamieson, *The Philosophy of Forensic Scientific Identification*, 59 HASTINGS L.J.1031 (2008).

that mark.⁴⁵ The examiner compares images of the questioned markings to those from the known and makes a judgement about whether they differ to an extent that the suspect should be excluded as the source, or that the similarities seem so great that the suspect should be included in the pool of possible contributors. In the case of crime scene markings created by one object leaving markings of itself on another object—such as a fingerprint onto a surface, a firearm barrel onto a bullet, or teeth onto skin—the faithfulness of the transfer from the original to the receiving surface, and the ability of the receiving surface to retain the impression unchanged, are essential to the probativeness of the comparison of the mark on the receiving surface to a suspected source.

Problems with declaring a ‘match’

In comparing the images of the questioned and the known, if examiners are left to their own subjective judgement of how similar two images need to be in order to declare them similar enough to be included in the pool, then inconsistencies will occur when different examiners look at the same evidence. The less well the criteria are defined and held in common among examiners, the more rife with inconsistency their work will be.⁴⁶

The description in the preceding paragraph is careful to avoid using the term ‘match’. Though employed with decreasing frequency, that word is still in wide use and is unexpectedly troublesome. The term has multiple meanings in the forensic context, which are easily conflated. The term risks misleading factfinders into believing the expert’s conclusion is more certain than pattern-matching conclusions can be.

One meaning has to do with observation. It says that the questioned and the known images share many similar features. This observation is almost never (and perhaps literally never) that the two images are identical, or indistinguishably alike. Differences are always present in all forensic pattern matching. Part of the examiner’s task is to try to decide which differences can safely be disregarded as unimportant and which similarities are of significance. Here, one might say, ‘they match’—if that statement simply means that the questioned and the known are highly similar in appearance.

A second meaning has to do with inference. The examiner’s ultimate goal is to try to infer whether the questioned and the known ‘share a common source’. Did the finger that made the file print make the latent print? Did the gun that fired the crime scene bullet fire the test bullet? In line with this meaning, one would like to say, ‘it’s a match’—that is, the one and only source of the crime scene evidence has been identified.

Such a conclusion can never be reached in more than a probabilistic sense, and for that reason the assertion of a ‘match’ to mean a definite inference of common source is misleading. It is impossible to know how many other sources could have made marks as similar to the crime scene mark as the one under examination. The most that can justifiably be said is that the known image belongs to a pool containing an unknown number of other objects that can produce images with very similar characteristics. This is precisely why DNA typing produces ‘random match probabilities’ (RMPs) rather than assertions that ‘the’ source of the crime scene DNA has been found. The RMPs provide the best available sense of the probability that a randomly selected person’s

⁴⁵ In regard to DNA, what we refer to as ‘markings’ or ‘marks’ would be equivalent to the visualizations of the DNA—at one time in the form of autorads, now as electropherograms.

⁴⁶ Research, described *infra*, suggests a high degree of interexaminer inconsistency among bitemark examiners.

DNA would ‘match’ the crime scene DNA (in addition to that of a suspect whose DNA profile has been found to ‘match’).⁴⁷

Upon hearing an expert witness state that an assertedly scientific process has determined that the questioned and the known are ‘a match’, factfinders can be forgiven for mistakenly thinking the identification is more certain than it is capable of being.⁴⁸

A third meaning of the word ‘match’ had been used until recently by forensic dentists. The American Board of Forensic Odontology’s⁴⁹ official guidelines for testifying to bite mark comparison opinions approved use of the term ‘match’ to mean: ‘Some concordance, some similarity, but no expression of specificity intended; generally similar but true for large percentage of population’.⁵⁰

Upon hearing that a suspected source and a crime scene object ‘matched’, laypersons in one study interpreted that term to indicate the strongest linkage (even though it was intended to be the weakest linkage) of any of the terms then available to forensic dentists for expressing their sense of the association between a bite mark and a suspect’s dentition.⁵¹ In the current ABFO Diplomates Reference Manual (2013), the term ‘match’ has been eliminated as an acceptable term for expressing opinions about bite mark source attribution.⁵²

To avoid the misunderstandings from which the term ‘match’ suffers, this article tries to avoid its use as much as possible. When that is not possible, we try to use it carefully.

Evaluation of an inclusion

If the decision reached by the examination process is inclusion of the suspected source, the next step is to evaluate the meaning of that inclusion. Its probativeness depends upon how many other members of the population could also have produced markings with a very similar appearance to the crime scene marks.

This evaluation is done most transparently in the methods of DNA comparison for single-source crime stains, where sampling of the relevant population has been conducted and informs examiners about the frequency of occurrence of the alleles being compared. That information allows calculation of the RMP, that is, the probability that a random member of the population has the same DNA profile as that collected at the crime scene. The more people in the population with the same profile (the larger the RMP), the less probative is the fact of the suspected source having the

⁴⁷ To say that every object of forensic interest is unique (that they can always be distinguished from each other, or that one can never be mistaken for another), are statements of speculation, not of empirical science. As a prominent population geneticist explained, ‘It is impossible to prove any human characteristic to be distinct in each individual without checking every individual, which has not been done’. DAVID J. BALDING, *WEIGHT-OF-EVIDENCE FOR FORENSIC DNA PROFILES* 54 (2005).

⁴⁸ At the same time, when one knows enough about the distribution of object attributes in the population, and the relevant probabilities in the case at hand are known (or believed on good grounds) to be sufficiently small, it is not irrational for a decision maker to conclude that the known and the questioned probably do share a common source.

⁴⁹ American Board of Forensic Odontology, *Diplomates Reference Manual* (January 2013), hereinafter referred to as the ABFO.

⁵⁰ *Modern Scientific Evidence* Chapter.

⁵¹ Dawn McQuiston & Michael J. Saks, *Communicating Opinion Evidence in the Forensic Identification Sciences: Accuracy and Impact*, 59 *HASTINGS L.J.* 1159 (2008).

⁵² ABFO *Diplomates Reference Manual* (Jan. 2013).

same profile. The fewer people in the population who share the profile (the smaller the RMP), the more probative is the fact of the suspected source having the same profile as the crime scene DNA.

Thus, some estimates of the size of the subpopulation that shares a profile with the crime scene mark are necessary to evaluate the meaning of a ‘match’. That is not to say it must be done just as DNA typing does it. But without some methods for evaluating the meaning of a suspected source having similar appearance to the crime scene evidence, a factfinder has no way to gauge how probative that fact is, and might be misled by testimony saying only that a suspected source has been judged to ‘match’ the crime scene mark—in whatever terms that fact might be expressed.

Because the forensic identification process is fundamentally probabilistic, absolute statements of identification are insupportable. ‘[T]he scientific basis is insufficient to conclude that bite mark comparisons can result in a conclusive match.’⁵³ Thus, any opinions expressed in terms suggesting pinpoint identification—such as ‘identification to the exclusion of all others’, ‘indeed and without doubt’, ‘certainty’, and ‘perfect match’—have been properly criticized by numerous authorities as exceeding what the forensic identification process is capable of.⁵⁴ Such extreme opinions are (now) disapproved by the ABFO as well: ‘Terms assuring unconditional identification of a perpetrator, or without doubt, are not sanctioned as a final conclusion.’⁵⁵ At the same time, in contradiction, the ABFO currently permits a conclusion that a suspect is ‘the biter’, which is an expression of unconditional identification. And, prefatory to all of the currently approved conclusions,⁵⁶ the ABFO requires: ‘All opinions stated to a reasonable degree of dental certainty’.⁵⁷

Recently, a subcommittee of the National Commission on Forensic Science has proposed that the Commission issues a caution against the use of the expression, ‘to a reasonable scientific certainty’, or its discipline-specific variants, to characterize an expert opinion: ‘It is the view of the National Commission on Forensic Science that the scientific community should not promote or promulgate the use of this terminology’. The National Commission on Forensic Science subcommittee explained that the expression has no scientific meaning and tends to be misleading to factfinders because it asserts certainty.⁵⁸

Exaggerated testimony expressing conclusions about pattern-comparison evidence—that is, testimony that exceeds what a field’s knowledge and techniques can

⁵³ NAS Report, at 175.

⁵⁴ *Id.* (at numerous points in the report).

⁵⁵ ABFO Diplomates Reference Manual (2013), at 119.

⁵⁶ *Id.*

⁵⁷ *Id.* (emphasis in original). See also Brandon L. Garrett & Peter J. Neufeld, *Invalid Forensic Science Testimony and Wrongful Convictions*, 95 VA. L. REV. 1, 68 (2009) (pointing out that, despite forswearing insupportable extreme opinions, the ABFO guidelines allow ‘members to give conclusions expressing near certainty. Examples of the conclusions they may draw include that a bite mark matches a criminal defendant to a “reasonable medical certainty,” “high degree of certainty,” and “visual certainty with no reasonable possibility that someone else did it.”’).

⁵⁸ National Commission on Forensic Science, *Testimony Using the Term ‘Reasonable Scientific Certainty’*, U.S. DEP’T OF JUSTICE (Apr. 2013). The proposed admonition apparently is aimed at witnesses and not courts because: ‘The Commission recognizes the right of each court to determine admissibility standards, but expresses this view as part of its mandate to ‘develop proposed guidance concerning the intersection of forensic science and the courtroom.’

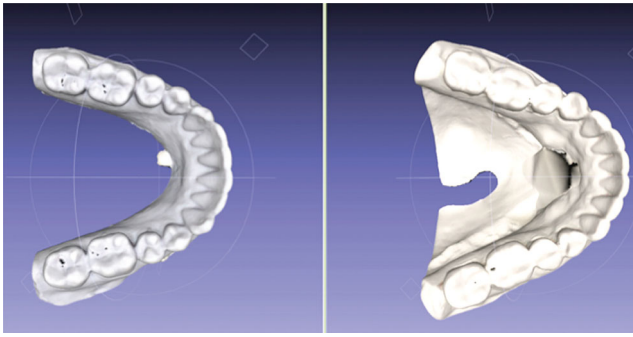


Figure 2. Indistinguishably similar dentition. Three-dimensional models of two different people's dentitions in which the six anterior (front) teeth were found to have the same three-dimensional shape, based on measurement error determined by repeated measurement. [Reprinted with permission of creator, Peter Bush.]

support—led the FBI to agree to review approximately 2500 cases worked from 1972 to 1999 by its own microscopic hair examiners. With about half the cases reviewed, 'by the FBI's count examiners made statements exceeding the limits of science in about 90 percent of testimonies, including 34 death-penalty cases.'⁵⁹

BITEMARK IDENTIFICATION IN LIGHT OF THE LOGIC OF FORENSIC IDENTIFICATION

Against the background of forensic identification more generally, the special difficulties of bite mark identification can be more readily appreciated.

The source of the bite mark

When trying to identify a decedent who has a full mouth of teeth by comparing those to dental records, a great deal of information is available.

The human adult dentition consists of 32 teeth, each with 5 anatomic surfaces. Thus, there are 160 dental surfaces that can contain identifying characteristics. Restorations, with varying shapes, sizes, and restorative materials, may offer numerous additional points of individuality. Moreover, the number of teeth, prostheses, decay, malposition, malrotation, peculiar shapes, root canal therapy, bone patterns, bite relationship, and oral pathology may also provide identifying characteristics.⁶⁰

But when trying to identify the source of a bite mark, only a fraction of that information is available:

[I]n the typical bite mark case, all 32 teeth cannot be compared; often only 4 to 8 are biting teeth that can be compared. See Fig. 2, which presents molds of the dentition from two

⁵⁹ Spencer S. Hsu, *FBI Admits Flaws in Hair Analysis Over Decades*, WASH. POST, Apr. 18, 2015, http://wapo.st/1OrujpH?tid=ss_mail (accessed August 28, 2016).

⁶⁰ FJC Reference Manual, at 104, 105.

different people (drawn from a sample of 500) whose six front teeth are indistinguishably alike. Similarly, all five anatomic surfaces are not engaged in biting; only the edges of the front teeth come into play.⁶¹

Moreover, the amount of information contained in the dentition involved in creating a bite mark is far less than that contained in fingerprints, DNA, and most other forms of forensic identification. Thus, the process of bite mark identification begins with a serious disadvantage relative to other types of forensic evidence: less information from the unknown specimen with which to work.

The substrate onto which a bite pattern is transferred

The potentially identifying information contained in the teeth that create a bite mark has to be captured by the material (the substrate) into which the bite is impressed. If the image of the bite mark in skin is undependable and unstable, then examiners cannot know whether they are looking at a true picture of the dentition that created the bite mark, or a distorted picture.⁶²

In the crime context where bite marks are found, that substrate usually is skin. Skin is a poor substrate for recording the pattern of teeth. It is far less able than the modern dental materials used in dental offices to capture and dependably retain the features of, say, a tooth being replaced by a crown. Skin is a viscoelastic material. The elastic property means that indentations left by teeth will rebound, leaving potentially no record of the three-dimensional structure of the biting edges of teeth. This reduces the information that may be used for comparison. The analysis then might typically consist of comparison of a bruise to a dental model. Because a bruise consists of diffusion of blood from crushed capillaries, no precise measurements can be made for comparison.

To further complicate the situation, biting in the criminal context typically occurs during struggles, during which skin is stretched and contorted at the time the bite mark is created. When the skin returns to its normal shape, the resulting image of the biter's dentition can be distorted to an unknown extent. Figure 3 illustrates what can happen when a marking is placed on skin that has been stretched and the skin then returns to its normal shape. Similarly, the position in which body parts are positioned postmortem can change the shape of the bite mark. Figure 4 illustrates this problem with an actual bite mark on the skin of a human cadaver.

In addition, live flesh reacts to injury, becomes inflamed, changes shape, and swells as healing begins. After death, changes in the skin and flesh occur due to decomposition, animal predation, insect activity, embalming, and environmental factors as well as other processes.

The pliability, elasticity, and reactivity of skin and flesh all create a major challenge for bite mark identification and set it apart from other kinds of pattern-comparison

⁶¹ *Id.* at 106.

⁶² Under most circumstances, this distortion should lead to more false-negative errors than to false positives. On the other hand, if the bite mark has not been accurately recorded in the flesh, and will not match the actual biter, it sometimes can match, or be made to match (through manipulations used to 'correct' distortions), the dentition of other persons. R.G. Miller et al., *Uniqueness of the Dentition as Impressed in Human Skin: A Cadaver Model*, 54 J. FORENSIC SCI. 909 (2009).

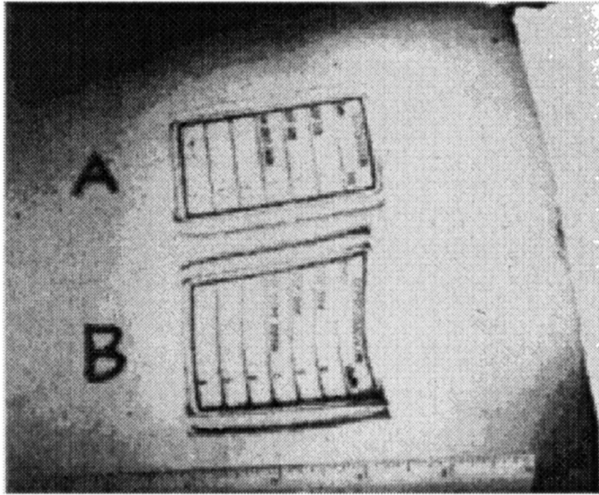


Figure 3. Two identical marks on human skin. The lower mark has been distorted by applying pressure to the area (duplicating Devore's Test). [In public domain.]

forensic identification. As the NAS Report concluded in regard to these substrate problems, 'These features may severely limit the validity of forensic odontology'.⁶³

Methods of comparison

When a forensic dentist undertakes to compare a questioned bite mark with a suspect's dentition, numerous techniques exist and are recognized by the ABFO Guidelines, including drawing bite mark images by hand.

The issue of the multiple methods of bite mark analysis continues to thwart any attempts to standardize procedures to any sort of 'gold standard.' The use of digital methods in the superimposition of bite mark evidence appears to be increasing, although the older, more experienced forensic dentists still seem to resist the use of two dimensional computer methods.⁶⁴

Although there has been some research-comparing techniques, finding some to be significantly better than others at facilitating the visualization of bite mark-to-dentition similarities and differences,⁶⁵ the guidelines do not specify criteria under which one method might be preferred to another. And, in any event, there is no oversight, so forensic dentists are free to use whichever method they happen to be familiar with or prefer.

Nor has the field of forensic odontology developed inclusion/exclusion criteria. Each examiner is left to form his or her own judgement about which features of the

⁶³ NAS Report, at 174.

⁶⁴ Modern Scientific Evidence Chapter; see also NAS Report, at 174, 175; ABFO Diplomates Reference Manual (2013).

⁶⁵ For example, David Sweet & C. Michael Bowers, *Accuracy of Bite mark Overlays: A Comparison of Five Common Methods to Produce Exemplars from a Suspect's Dentition*, 43 J. FORENSIC SCI.362 (1998) (finding differences in accuracy as a function of method and recommending that forensic dentists cease using hand drawings of a suspect's teeth and increased use of digital images of dental characteristics).

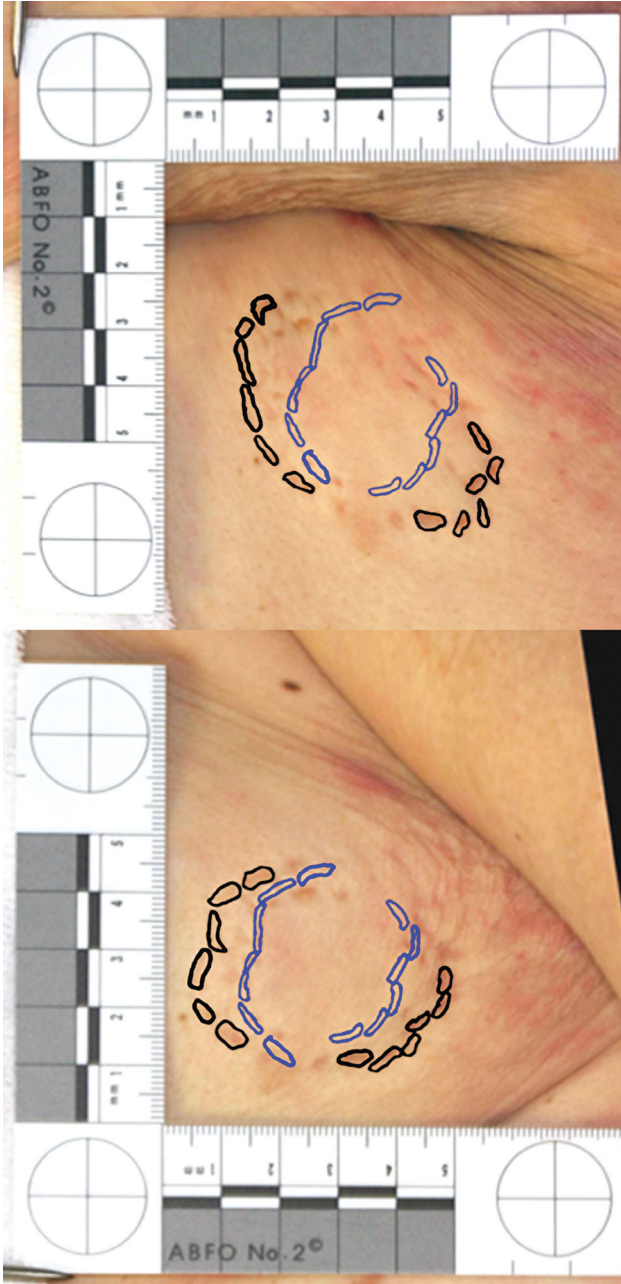


Figure 4. Changes in bitemark appearance depending upon how the body part is positioned. The bite was inflicted with the arm straight at the side (left). The bitemark is outlined in black for ease of viewing; biter's overlay is in blue. Notice the alteration to the bite pattern when the arm is positioned over the head (right). [Reprinted with permission of creator, Peter Bush.]

bite mark to compare and whether to declare a (suspected) bite mark and a suspect's dentition to be so similar that the examiner should declare an inclusion. Absent from bite mark analysis are 'precise and objective criteria for declaring matches', considered to be essential elements of any field of forensic identification.⁶⁶

Lack of data on population frequencies

To this point, we have addressed potentially insurmountable difficulties in bite mark identification that involve nothing more than the seemingly straightforward task of comparing a questioned bite mark to a suspect's dentition. Assume, however, an optimal case: sufficient information from source dentition exists and has been impressed upon a stable substrate on a victim's body; that sound methods have been employed to visualize and compare the bite mark on the victim and a suspect's dentition; that valid criteria have been developed for deciding when to include and when to exclude dentition as a possible source; and that a forensic dentist has reached a justifiable conclusion that the images were sufficiently similar to include. The next step would be to assess what that decision can tell a factfinder about the likelihood that the suspected person's dentition did in fact produce the bite mark. As discussed earlier, such an evaluation depends upon estimating the frequency of similar patterns in the relevant population.

Unfortunately, forensic dentists have very little information of the kind needed to make an informed assessment. 'If a bite mark is compared to a dental cast using the guidelines of the ABFO, and the suspect providing the dental cast cannot be eliminated as a person who could have made the bite, there is no established science indicating what percentage of the population or subgroup of the population could also have produced the bite.'⁶⁷ Actual probabilities are not known because no population studies have been carried out to determine what features to consider, much less the actual degree of variation in teeth shapes, sizes, positions, etc., that exist in the population.⁶⁸ Work to remedy this shortcoming is at an early stage.⁶⁹

Recent studies, however, have cast light on the risk of erroneously calling similar dentitions a 'match' by establishing 'match' rates among dental populations using methods of measurement resolution that are better than can possibly be achieved with marks on skin. In these studies, a 'match' was defined as specimens that could not be determined as distinguishable within measurement error.⁷⁰ A fundamental conclusion

⁶⁶ Eric S. Lander, *Fix the Flaws in Forensic Science*, N.Y. TIMES, Apr. 21, 2015 (arguing '[n]o expert should be permitted to testify without showing three things: a public database of patterns from many representative samples; precise and objective criteria for declaring matches; and peer-reviewed published studies that validate the methods').

⁶⁷ NAS Report, at 174.

⁶⁸ *Id.*

⁶⁹ L. Thomas Johnson et al., *Quantification of the Individual Characteristics of the Human Dentition*, 59 J. FORENSIC IDENTIFICATION 609 (2009) (reporting one original study, observing that, 'Very few studies have been published on the quantification of dental characteristics', and noting that, 'Expansion of the sample size through collaboration with other academic researchers will be necessary to be able to quantify the occurrence of these characteristics in the general population').

⁷⁰ Mary A. Bush et al., *Statistical Evidence for the Similarity of the Human Dentition*, 56 J. FORENSIC SCI. 118 (2011); H. David Sheets et al., *Dental Shape Match Rates in Selected and Orthodontically Treated Populations in New York State: A Two Dimensional Study*, 56 J. FORENSIC SCI. 621 (2011); Mary A. Bush et al., *Similarity and Match Rates of the Human Dentition In Three Dimensions: Relevance to Bite Mark Analysis*, 125 INT'L J. LEG. MED. 779 (2011); H. David Sheets et al., *Patterns of Variation and Match Rates of the Anterior Biting Dentition:*

from these studies was that as any database of dental arrangement increases in size, the probability of one dental arrangement matching another one increases. This was especially true in analysis of orthodontically treated dentitions, in which dental arrangements are purposely made homologous.⁷¹ The latest of these studies ($n = 1099$) documented the most common patterns of dental malalignment three dimensionally in a large population. This study also found that the effect of increasing distortion (reducing measurement resolution) was that dramatically larger numbers of dentitions ‘matched’.⁷² In short, these recent studies indicate that, given relatively large numbers of people with seemingly unusual misalignments of teeth, compared using the relatively poor resolution of teethmarks on skin, the risk of false positive errors is quite real.

In the absence of data concerning population frequencies of dental characteristics, how have forensic dentists assessed the value of an inclusion? One way has been to speculate or guesstimate about the population frequencies of the characteristics of biting teeth. A forensic dentist might judge a bite mark to have been made by a pattern of teeth that seems unusual in his or her experience. On occasion, a source’s teeth are so unusual that they are obvious outliers; then, when a suspect’s teeth are deemed closely similar (a well-defined bite mark, impressed into a stable substrate), the probability is smaller that a different person will have produced the bite mark.⁷³ Nevertheless, a forensic dentist’s placing too much faith in the apparent unusualness of a source dentition has led to known erroneous convictions. There is no escaping the fact that forensic identification is an essentially probabilistic endeavor. For the great majority of bite marks, however, population frequencies will necessarily be higher than in the very unusual cases, and the risk of erroneous identification greater.⁷⁴

Uniqueness

The conventional solution to the problem of assessing the meaning of a ‘match’ has been to assume uniqueness. ‘Identification of a suspect by matching his or her dentition with a bite mark found on the victim of a crime rests on the theory that each person’s dentition is unique’.⁷⁵ But as the uniqueness assumption has increasingly come to be recognized as unproved and unsound, it also has ceased to serve as a viable solution to the problem of how to evaluate the meaning of a high degree of similarity between a bite mark and a suspect’s dentition.

Two different concepts are expressed by the notion of bitemark ‘uniqueness’.⁷⁶ One is the claim that no two dentitions duplicate one another in absolutely every respect.

Characteristics of a Database of 3D Scanned Dentitions, 58 J. FORENSIC SCI. 60 (2013). Measurement error, and thus the resolution of measurement of the dental arrangement, was quantified by repeated measurements of the same specimen, followed by analysis of the scatter of the measurement points. Resolution was determined to be 120 μm , or slightly more than one-tenth of a millimeter.

⁷¹ Sheets et al., *Dental Shape Match Rates*, *supra* note 70.

⁷² Sheets et al., *Patterns of Variation*, *supra* note 70.

⁷³ See Gerald L. Vale et al., *Unusual Three-Dimensional Bite Mark Evidence in a Homicide Case*, 21 J. FORENSIC SCI. 642 (1976).

⁷⁴ The high error rates for bite mark identification, described *infra*, likely are in part caused by a tendency toward underguesstimation by forensic dentists of the probability that multiple members of a population will match a questioned bite mark.

⁷⁵ FJC Reference Manual, at 104.

⁷⁶ Simon A. Cole, *Forensics Without Uniqueness, Conclusions Without Individualization: The New Epistemology of Forensic Identification*, 8 L. PROBABILITY & RISK 233 (2009).

This has been termed ‘mere uniqueness’. An even stronger claim is being made by forensic dentistry: not only that all dentitions are unique, but also that every bite mark produced by those dentitions can be associated only with themselves and not with any other dentition. If this claim were true, it would indeed be possible to conclude that a dentition found consistent with a mark is the source of that mark. But we know from the substrate problems described, above, and from systematic empirical research as well as observations by practicing forensic dentists that repeated bites by a single set of dentition produce very different bite markings.

The advantage of adopting and asserting the assumption of uniqueness is that it obviates the need to collect, analyse, and employ information about the population distribution of dentitions and bite mark characteristics. Much of the hard work of empirical research can be dispensed with. If no two dentitions belonging to different persons can possibly produce bite marks that are indistinguishably alike or confusingly similar, then a judgement that a questioned bite mark looks much like a suspect’s dentition is assumed to mean that the suspect is ‘the’ source of the bite mark, not merely a member of a pool containing some unknown number of possible contributors.

The problem with the assumption of uniqueness is that it is nothing more than *ipse dixit*. The NAS Report on forensic science stated:

No thorough study has been conducted of large populations to establish the uniqueness of bite marks; theoretical studies promoting the uniqueness theory include more teeth than are seen in most bite marks submitted for comparison. There is no central repository of bite marks and patterns. Most comparisons are made between the bite mark and dental casts of an individual or individuals of interest. Rarely are comparisons made between the bite mark and a number of models from other individuals in addition to those of the individual in question.⁷⁷

In sum, ‘The committee received no evidence of an existing scientific basis for identifying an individual to the exclusion of all others’.⁷⁸

A recent review sought to examine all empirical research aimed at determining whether all human dentition is unique.⁷⁹ Following an extensive bibliographic database search, 13 studies were found and each was reviewed in detail. None was able to support a conclusion of dental uniqueness. Nine of the studies explicitly failed to find uniqueness. Four claimed to have succeeded, but were found to be methodologically incapable of supporting the asserted conclusions. Four additional studies⁸⁰ found specimens in the study populations that were indistinguishable within measurement resolution—that is, their differences did not exceed the margin of error for the study population.

These findings bring the notion of dental uniqueness, central to bite mark analysis, into considerable doubt. As the assumption of uniqueness fades away, so does the claim that bite mark comparison can dependably link a bite mark to its source.

⁷⁷ NAS Report, at 174.

⁷⁸ *Id.* at 176.

⁷⁹ Ademir Franco et al., *The Uniqueness of the Human Dentition as Forensic Evidence: A Systematic Review*, 126 INT’L J. LEGAL MED. 1277 (2015).

⁸⁰ See *supra* note 60.

In light of these developments, the ABFO has recently backed away from the theory of uniqueness and the associated notion of identification-to-the-exclusion-of-all-others.⁸¹ The ABFO has gone so far as to suggest that any attempt to narrow identification to a single individual has to be limited to cases involving ‘closed populations’—that is, cases in which only a small number of known persons could have been in a position to inflict the questioned bite. Forensic dentists then need only distinguish among the dentition of a handful of known people, not speculate about tens of millions of unknown dentitions.⁸²

HOW ACCURATE ARE BITEMARK IDENTIFICATIONS?

The empirical research described in this section is noteworthy, first, for how little of it there is and, second, for how much of what does exist refutes the claims of forensic dentists regarding their ability to identify the source of a bite mark.

Measuring error—generally

In the context under discussion, decision error consists of two distinct types: a ‘false positive’, which is a decision that a bite mark came from a specific set of teeth when in fact it was made by other teeth and a ‘false negative’, a decision that a bite mark did not come from a specific set of teeth, when in fact it did. However, the forensic comparisons are reported—‘match’, ‘consistent with’, ‘cannot exclude’—the opinions would all be classified as false positives if the ‘ground truth’ is that the bite mark did not actually come from the teeth of the suspect.⁸³

False-negative errors could occur for many reasons—some pertaining to the circumstances of the bite and the substrate receiving the bite, some pertaining to the medium the examiner is using to visualize the questioned and known patterns (eg photographs under different lighting conditions), others pertaining to the decision-making machinery of the examiners. Careful research would need to be designed in order to isolate the various possible causes of the errors and to try to develop ways to reduce errors stemming from those causes. Similarly, false-positive errors could occur for a variety of reasons, pertaining to different aspects of the bite sources, tools for and conditions of visualizing the bite marks, or the perceptual and decision characteristics of examiners.

Although the terms ‘reliability’ and ‘validity’ often are used interchangeably by laypersons, it is useful to maintain the distinction used by scientists and statisticians.⁸⁴ Scientists and statisticians distinguish between and separately measure reliability and validity. ‘Reliability’ is the extent to which a measuring instrument (including human examiners) produces the same results again and again when it measures the same thing

⁸¹ The most recent editions of the ABFO Diplomates Reference Manual state that the identification of a single biter from an open population of possible biters is no longer sanctioned.

⁸² Even here, the rhetoric has again gotten ahead of any empirical research on the issues involved. Moreover, if investigators are mistaken about access being limited to all but the identified suspects, then we are back to an open population, only we don’t know it. Furthermore, even the ‘closed population’ approach does not preclude errors of erroneously identifying an innocent suspect as the perpetrator. See the Gordon Hay case in Scotland. Case review presented at the 2000 meeting of the Forensic Science Society by Dr. Allan Jamieson.

⁸³ This approach to ‘accuracy’ comes from the field of signal detection theory. Propounded in the 1960s in such works as DAVID M. GREEN AND JOHN A. SWETS, SIGNAL DETECTION THEORY AND PSYCHOPHYSICS 1 (1966).

⁸⁴ See *Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579, 590 n.9 (1993) (discussing the distinction and stating, ‘In a case involving scientific evidence, *evidentiary reliability* will be based upon *scientific validity*’.) (emphasis in original).

repeatedly. Intraexaminer (or within-examiner) unreliability refers to the same examiner giving different answers on different occasions when examining the very same evidence. Interexaminer (or between-examiner) unreliability refers to different examiners examining the same evidence and reaching different conclusions about it.

Reliability concerns only consistency of measurement. It does not address whether a measurement is correct. ‘Validity’ is concerned with the question of whether a measuring instrument (including the judgements, decisions, and opinions of humans) is generating correct answers. Five forensic dentists might all agree on whether or not a suspect’s dentition made a bite mark (high reliability), but they might all be incorrect (low validity).⁸⁵

Recent research on reliability

The ABFO recently sponsored and conducted a reliability study of the judgements of experienced, board-certified forensic dentists making very basic decisions about bite marks.⁸⁶ The researchers selected 100 photographs of suspect bite mark injuries from actual cases. These were examined by 38 ABFO-certified forensic odontologists having an average of 20 years’ experience in bite mark identification.

The 38 examiners were asked to review the injuries in each of the 100 photographs and respond to three very basic questions. As will become apparent, the greater the degree of agreement among the examiners, the more reliability is indicated (that is, repeatability of judgements by different examiners), and the lower the rate of agreement, the less reliable their judgements are. No one can know which answers were right or wrong (that is, this was not a test of validity). We can know only the extent to which they agreed or disagreed with each other.

Question 1: Is there sufficient evidence in the presented materials to render an opinion on whether the patterned injury is a human bite mark? Findings: for only 4 of the 100 cases, did all examiners agree on whether an opinion could be reached on whether an injury was a bite mark or not. For half of the cases, there was less than 71 per cent agreement. For one quarter of the cases, there was less than 47 per cent agreement.

Question 2. Is it a human bite mark, not a human bite mark, or suggestive of a human bite mark? Findings: in about a quarter of the cases, fewer than half of the examiners agreed on whether the injury was or was not a bite mark. In 71 of the 100 cases, fewer than 70 per cent agreed on whether the injury was a bite mark.

Question 3. Does the bite mark have distinct, identifiable arches and individual tooth marks?

⁸⁵ This is not a fanciful illustration. In the 1984 Forensic Sciences Foundation handwriting proficiency test of handwriting experts, all of the examiners taking the test independently reached the same conclusion that a particular writer was not the author of a particular questioned document (100 per cent reliability), but they were all incorrect (0 per cent validity). Summarized in D. Michael Risinger, *Handwriting Identification*, in *MODERN SCIENTIFIC EVIDENCE: THE LAW AND SCIENCE OF EXPERT TESTIMONY* (David L. Faigman et al. eds, 2013).

⁸⁶ These results were presented at the annual meeting of the 2015 American Academy of Forensic Sciences, held in Orlando, Florida, in February. ABFO officials have indicated that they do not wish the results published until further research has been conducted. However, the researchers supplied the raw data to a number of people, and we draw from their descriptions of it. The one published description is found in Radley Balko’s, *A Bite Mark Matching Advocacy Group Just Conducted a Study that Discredits Bite Mark Evidence*, WASH. POST, Apr. 8, 2015, <http://wpo.st/Rh5v1> (accessed August 28, 2016).

By the time they reached Question 3, the examiners were already widely divided from each other in their opinions. Those who did not think that the injury photograph contained enough information to make a decision did not opine on whether it was or was not a bite mark. Those who did not think that the injury was a human bite mark would not be addressing whether individual tooth marks were identifiable.

Taking all three questions together, for just under half of the cases, half or fewer of the examiners agreed on the same trio of responses. For only 14 of the 100 cases, did at least 80 per cent of the examiners agree on the trio of responses.

Although no one knows which answers of which examiners were correct or not (the validity question), one can be sure that many answers were incorrect since contradictory answers cannot all be correct. The reliability of a measuring instrument sets an upper limit on its possible validity.

The study just described suggests that on this earliest threshold issue—before any of the other difficulties of bitemark ‘comparison’ have to be confronted—bitemark analysis has not been shown to be reliable (let alone valid). Put simply, if dental examiners cannot agree on whether or not there is enough information in an injury to determine whether it is a bite mark, and cannot agree on whether or not a wound is a bite mark, then there is nothing more they can be relied upon to say. Unless and until they can do this threshold task dependably, there is no other aspect of bitemark identification that can be counted upon to produce dependable conclusions.

Studies of forensic dentists’ accuracy in simulated bitemark lineups

Over the approximately four decades in which forensic dentists have been testifying in courts claiming the ability to accurately identify the individuals who were the sources of bite marks, remarkably few tests have been carried out to assess their accuracy. While there have been hundreds of studies of eyewitness accuracy, and many dozens of proficiency tests of forensic examiners in other fields, forensic dentists have been tested only a handful of times.

Such tests as exist present practitioners with bite marks to compare under circumstances where those conducting the study know which answers are correct and which are incorrect.

The earliest of these tests were conducted in the mid-1970s by forensic dentist David Whittaker.⁸⁷ Exemplar bites were made on pigskin. Note that pigskin is a more stable material for recording and retaining a bite mark than living human skin, so that tests using pigskin as the substrate would likely overstate the accuracy obtained by bitemark examiners. Incorrect identifications of the bites made in the Whittaker study ranged from 24 per cent under ideal conditions to 91 per cent when identifications were made from photographs taken 24 hours after the bites were made (which is more typical of how bitemark comparisons are done). Whittaker commented that, ‘the inability of examiners to correctly identify bitemarks in skin ... under *ideal* laboratory conditions and when examined immediately after biting suggests that under sometimes adverse conditions found in an actual forensic investigation it is unlikely that a greater degree of accuracy will be achieved’.

⁸⁷ David K. Whittaker, *Some Laboratory Studies on the Accuracy of Bite Mark Comparison*, 25 INT’L DENT. J. 166 (1975).

The ABFO conducted several ‘workshops’ in which forensic dentists could test their identification skills. Only the 1999 workshop results have been made public. In that test, ‘All 95 board certified diplomates of the American Board of Forensic Odontology were eligible to participate in the study. Of the 60 diplomates who requested and were sent the study material, 26 returned the necessary data by the deadline [six months after receiving the test materials] and were included in the data results’.⁸⁸

All four of the ‘questioned’ bites were made by biters whose identity was known. Three consisted of materials from actual cases (in which the biter’s identity was established by independent means), and the fourth was a bite into cheese. Each of those bite marks was compared to what in effect was a lineup of seven bites. Overall, examiners were in error on nearly half of their responses, more of those being false-positive errors (identifying a non-biter as being the biter) than false negatives (failing to identify the actual biter).⁸⁹

In 2001, in the course of evaluating digital overlays as a technique for comparing known and questioned bite marks, forensic dentists Iain Pretty and David Sweet observed levels of error by examiners that troubled them: ‘While the overall effectiveness of overlays has been established, the variation in individual performance of odontologists is of concern’.⁹⁰ Using board-certified forensic dentists to evaluate the test bite marks (made in pigskin), the study found that intraexaminer agreement (agreement with one’s own prior judgements given three months earlier) ranged as low as 65 per cent. False-positive responses (affirmatively linking a bite to a person who had not made the bite) averaged 15.9 per cent (and ran as high as 45.5 per cent), while false negatives (failing to link a bite to the person who actually made it) averaged 25.0 per cent (and ran as high as 71.4 per cent).

Blackwell and colleagues in 2007 examined forensic dentists’ analyses of bite marks using 3D imaging and quantitative comparisons between human dentitions and simulated bite marks, with the bite marks recorded in acrylic dental wax—a far better substrate for bite mark comparisons than human skin—and false-positive error rates still ran as high as 15 per cent.⁹¹

⁸⁸ Our description of the study and its findings is taken from the Modern Scientific Evidence Chapter on bite mark identification.

⁸⁹ Out of a possible maximum error rate of 27 per cent, examiners had a median overall error rate of 12.5 per cent, for an error rate that in effect was 46 per cent. Forensic dentist Michael Bowers, in Modern Scientific Evidence Chapter, explains why caution is needed in counting errors in such tests: ‘Once one set of dentition is linked (correctly or incorrectly) to a bite mark, the others are not linked, and therefore are scored as ‘correct.’ In other words, given the test design, an examiner could never make more than two mistakes, and all remaining dentitions are scored as ‘correct’. If instead of providing a set of seven dentitions from which to choose, there had been 100, then the overall accuracy rate, using this seemingly straightforward method of counting, could never be lower than 98 per cent correct—one false positive inculpation of an innocent suspect, one overlooked guilty suspect, and 98 remaining dentitions that get scored as ‘correct’. And, thus, the poorest possible performance would be ‘2 per cent error’.

⁹⁰ Iain A. Pretty & David J. Sweet, *Digital Bite Mark Overlays—An Analysis of Effectiveness*, 46 J. FORENSIC SCI. 1385 (2001) (cautioning that the ‘[p]oor performance’ is a cause of concern because of its ‘very serious implications for the accused, the discipline, and society’, at 1390).

⁹¹ Sherie A. Blackwell et al., *3-D Imaging and Quantitative Comparison of Human Dentitions and Simulated Bite Marks*, 121 INT’L J. LEGAL MED. 9 (2007).

Studies of bite marks in a cadaver model

Another line of simulation research sought to understand the ‘accuracy’ of skin as a substrate for recording bite marks. Mary and Peter Bush of the School of Dental Medicine at the State University of New York at Buffalo, along with statistician David Sheets, have produced an extensive body of research.⁹² They obtained access to a reliable supply of fresh cadavers. They designed a biting machine to inflict bites that could be fitted with various cast dentitions from their reference collection, and proceeded to apply multiple bites from the same and different dentitions to different areas of cadaveric skin. They then analysed the resulting bite marks and compared them to the dentitions in their collection, using digitized modeling and various statistical techniques.

The first major finding was that, due to the anisotropic⁹³ properties of skin, no two bite marks inflicted by the same dentition appeared the same.⁹⁴ If bite marks are not reproducible, then doubt increases about the evidentiary reliability of bitemark analysis. Both the biomechanical properties of human skin and the way it reacts to biting result in marks that often can be seen and characterized as fitting multiple different sets of dentition even within the researchers’ rather small reference sample (measured in the hundreds). The apparently ‘matching’ dentitions frequently did not include the dentition that actually did the biting, and the actually ‘matching’ dentitions frequently were not similar to each other.

These findings suggest that accurate source attributions (that is, determining which dentition made which bite), is likely to require the bites to have been in more stable substrates (such as wax or cheese). The degree of distortion found in the marks on skin was such that even large variations in tooth arrangements did not faithfully transfer, making profiling (prediction of dental characteristics) unreliable. In addition, the level of distortion was often far above the measurement resolution of dental shapes (discussed above), allowing a potential ‘match’ of numerous dentitions in any given population.

To better understand the implications of this line of work, it is helpful to keep in mind the range of possible substrates. At one extreme is the kind of material used in dental offices to create molds of patients’ dentition. That material is designed to receive and hold impressions of teeth with a high degree of accuracy and stability. There is nothing better for the purpose. At the other extreme are elastic and unstable substances that cannot capture details and that subsequently change shape, distorting the tooth

⁹² Mary A. Bush et al., *Biomechanical Factors in Human Dermal Bitemarks in a Cadaver Model*, 54 J. FORENSIC SCI. 167 (2009); Raymond G. Miller et al., *Uniqueness of the Dentition as Impressed in Human Skin: A Cadaver Model*, 54 J. FORENSIC SCI. 909 (2009); Mary A. Bush et al., *The Response of Skin to Applied Stress: Investigation of Bitemark Distortion in a Cadaver Model*, 55 J. FORENSIC SCI. 71 (2010); Mary A. Bush et al., *Inquiry into the Scientific Basis For Bitemark Profiling and Arbitrary Distortion Compensation*, 55 J. FORENSIC SCI. 976 (2010); H. David Sheets & Mary A. Bush, *Mathematical Matching of a Dentition to Bitemarks: Use and Evaluation of Affine Methods*, 207 FORENSIC SCI. INT’L 111 (2011); Mary A. Bush et al., *A Study of Multiple Bitemarks Inflicted in Human Skin by a Single Dentition Using Geometric Morphometric Analysis*, 211 FORENSIC SCI. INT’L 1 (2011); Hannah Holtkoetter et al., *Transfer of Dental Patterns to Human Skin*, 228 FORENSIC SCI. INT’L 61 (2013). These were the first studies in the bite mark field to investigate and summarize the biomechanical and structural properties of skin, including the J-shaped curve that describes the stress–strain relationship.

⁹³ To have physical properties that are different in different directions.

⁹⁴ The same conclusion was expressed recently by two prominent bitemark practitioners testifying about their casework: Frank Wright, testifying in *State v. Prade*, No. CR 1998-02-0463, 2013 WL 658266 (Ohio Com. Pl. Jan. 29, 2013), *rev’d* 2014-Ohio-1035, 9 N.E.3d 1072 (‘No two bite marks that I’ve ever seen from the same biter on the same victim look the same’.) David Senn, testifying in *New York v. Dean*, 04555 CR2007 (N.Y. Sup.Ct., June 12, 2012) (‘They are surprised... when the same teeth make bitemarks and they all look different, well we’ve known that forever’). (Transcripts on file with author.)

impression as they do. Skin, as a substrate, is closer to the latter extreme. The research described above used cadavers. Because the skin of cadavers lacks the vital response, and does not undergo the changes caused by inflammatory reactions—while most bite marks encountered by courts have been imposed on living victims—it is important to appreciate that the substrate used in the research is more stable, closer to the dental office material end of the spectrum than living flesh is. Consequently, the research is more conservative in that by employing a more stable substrate it obtained ‘more accurate’ impressions than can be found in criminally inflicted bites. Moreover, it did so under more controlled conditions, preventing the distortion and slippage due to movement that occurs in a criminal struggle. Put simply, if the research found worrisome levels of variability in bite marks and erroneous ‘matches’, then bites from actual criminal cases will suffer from more extreme imperfections and be that much more prone to error.

CONCLUSION

The scientific community, and society generally, expects that before being offered to courts, and before courts grant broad and unqualified admission, the claims for a field’s techniques will have been validated.⁹⁵ This validation has not happened for bite mark identification. Moreover, recent reviews of the field’s claims, 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. A committee of the National Academy of Sciences concluded that bite mark identification testimony has been ‘introduced in criminal trials without any meaningful scientific validation, determination of error rates, or reliability testing...’⁹⁶ Two leading forensic dental researchers have noted that there is ‘a lack of valid evidence to support many of the assumptions and assertions made by forensic dentists during bite-mark comparisons’.⁹⁷

The claims of forensic dentistry have for decades outrun empirical testing of those claims. Rather than confirming the field’s claims, recent research, described in this article, has confirmed that the foundations of bite mark identification are unsound. Asserted bite mark experts ‘have yet to establish either the validity of their approach or the accuracy of their conclusions, and the courts have been utterly ineffective in addressing this problem’.⁹⁸

The rise and coming fall of bite mark evidence has left a trail of miscarriages of justice in its path. A series of individuals have been exonerated by DNA testing in cases involving bite mark evidence and still more have been exonerated by non-DNA evidence. Some of those individuals spent years or even decades in prison. The trial judges who uncritically accepted that bite mark evidence, and the appellate judges and federal habeas judges who did the same, have now had their own judgment called into question. The opinions that rubberstamped the use of such flimsy evidence now stand as a warning to future judges that they must actually endeavor to carefully apply the law’s

⁹⁵ The scientific perspective is that fields’ claims are considered valid only to the extent that they have been empirically tested, using soundly designed research, yielding results that support the claims. That is also the perspective advanced by *Daubert*, *supra* note 84, as well by *Frye v. United States*, 293 F. 1013 (App. D.C. 1923) (though less explicitly than in *Daubert*).

⁹⁶ NAS Report, at 107, 108.

⁹⁷ See *Pretty & Sweet, Critical Review*, *supra* note 30, at 85.

⁹⁸ NAS Report, at 53.

gatekeeping criteria in criminal cases, and not simply grandfather in the evidence by citing to old opinions that themselves did not apply meaningful scrutiny.

If evidence as unreliable as bitmark evidence could go unquestioned in the courts and unsupported by research from the scientific community, what does that say about the larger field of forensics? Clearly, far more work needs to be done to improve judicial review and scientific research. It has taken more than three decades to begin to undo the massively unsupported field of bitmark evidence. Other fields, such as voiceprint identification and comparative bullet-lead analysis, did rise and fall more quickly. A wide range of forensic disciplines, however, continue to be used, despite questions about their validity. The FBI and a series of crime labs have only recently begun to examine old cases involving, for example, the use of microscopic hair comparisons.⁹⁹ Errors in calculation of DNA statistics in recent years are only beginning to be addressed by crime labs through audits.¹⁰⁰ The long tail of unsound science in the case of bitmark evidence suggests that: (i) the scientific community must more carefully engage with the research foundations of forensics, and not just in landmark but infrequent national commissions; (ii) lawyers must aggressively brief challenges to foundations of forensic techniques; and (iii) judges must be far more willing to carefully examine forensic evidence before admitting it. Many observers, including the National Academy of Sciences in its report, have called for a systemic renewal of such legal and scientific efforts and progress has been slow. The rise and impending fall of bitmark evidence powerfully illustrates the costs of the failure to assure that what enters our criminal courts is sound science.

APPENDIX

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⁹⁹ Federal Bureau of Investigation, *FBI Clarifies Reporting on Microscopic Hair Comparisons Conducted by the Laboratory* (July 13, 2012); see eg Texas Forensic Science Commission, *Texas Hair Microscopy Case Review*, <http://www.fsc.texas.gov/texas-hair-microscopy-case-review> (accessed August 28, 2016).

¹⁰⁰ Associated Press, *Texas Reviewing Thousands of DNA Cases that Used Outdated Method for Calculating Odds*, DALLAS NEWS, Jan. 31, 2016, <http://www.dallasnews.com/news/crime/headlines/20160131-texas-reviewing-thousands-of-dna-cases-that-used-outdated-method-for-calculating-odds.ece> (accessed August 28, 2016).

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