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SUPERIOR COURT OF NEW JERSEY
APPELLATE DIVISION
DOCKET NO. A-5929-17T2

STATE OF NEW JERSEY,

Plaintiff-Respondent,

v.

STEVEN R. FORTIN,

Defendant-Appellant.

APPROVED FOR PUBLICATION

June 22, 2020

APPELLATE DIVISION

Argued telephonically April 29, 2020 –
Decided June 22, 2020

Before Judges Koblitz, Whipple and Gooden Brown.

On appeal from the Superior Court of New Jersey, Law Division, Middlesex County, Indictment No. 95-09-1197.

Tamar Y. Lerer argued the cause for appellant (Joseph E. Krakora, Public Defender, attorney; Tamar Y. Lerer, Assistant Deputy Public Defender, of counsel and on the briefs).

Nancy A. Hulett argued the cause for respondent (Christopher L.C. Kuberiet, Acting Middlesex County Prosecutor, attorney; Nancy A. Hulett, Acting Assistant Prosecutor, of counsel and on the brief).

Dana Delger, (Skadden Arps Slate Meagher & Flom LLP) of the New York bar, admitted pro hac vice, argued the cause for amicis curiae Innocence Project Inc. (Skadden Arps Slate Meagher & Flom LLP, attorneys; Maura Barry Grinalds, Edward L. Tulin, and Benjamin J. Rankin, of counsel; Andrew Muscato, Vanessa Potkin, and Dana Delger, on the brief).

The opinion of the court was delivered by

KOBLITZ, P.J.A.D.

Defendant Steven R. Fortin, whom juries twice convicted of a brutal 1994 sexual assault and murder, appeals from a May 4, 2018 order denying his motion for a new trial based on newly discovered scientific evidence that casts doubt on the reliability and scientific validity of bitemark identification. We affirm.

In September 1995, defendant was indicted for first-degree knowing or purposeful murder, N.J.S.A. 2C:11-3(a)(1) and (2); first-degree felony murder, N.J.S.A. 2C:11-3(a)(3); first-degree robbery, N.J.S.A. 2C:15-1; first-degree murder while committing a sexual assault, N.J.S.A. 2C:11-3(a)(3); and first-degree aggravated sexual assault, N.J.S.A. 2C:14-2(a). The State sought the death penalty.

Prior to defendant's first trial for the murder and sexual assault of M.P.,[1] the New Jersey Supreme Court affirmed, in an interlocutory appeal, the ruling allowing the State to introduce N.J.R.E. 404(b) evidence that defendant had committed a similar sexual assault against Maine State Trooper V.G. based on the unusual combination of bitemarks found on M.P.'s and V.G.'s chin and left breast. State v. Fortin (Fortin I), 162 N.J. 517, 519 (2000). The Court also held that Robert Hazelwood, the State's proposed expert on violent sexual crimes, could be qualified as an expert on the ritualistic and signature aspects of the crime under N.J.R.E. 702, but could not testify on the "ultimate issue" of whether the person who assaulted V.G. in Maine was the same person who murdered M.P. in New Jersey. Id. at 525-29. The Court found that Hazelwood's testimony could be helpful to the jury in showing that the evidence established an "unusual pattern," provided he could "from a reliable database offer evidence that a combination of bitemarks on the breast, bitemarks on the chin, and rectal tearing inflicted during a sexual attack is unique in his experience of investigating sexual assault crimes." Id. at 532.

[1] We use initials to preserve the privacy of a victim of sexual offenses. R. 1:38-3(12).

In 2000 a jury convicted defendant and sentenced him to death for the 1994 murder and sexual assault of M.P. Our Supreme Court reversed that conviction and remanded for a new trial, in part because Hazelwood failed to produce a "reliable database," let alone "any database," as required by Fortin I. State v. Fortin (Fortin II), 178 N.J. 540, 558, 586-90 (2004).

Prior to the retrial, in an interlocutory appeal before our Supreme Court, the State sought to again introduce defendant's sexual assault of V.G. as N.J.R.E. 404(b) evidence, to demonstrate that the bitemarks on V.G. "were akin to a signature that identified defendant as M.P.'s killer." State v. Fortin (Fortin III), 189 N.J. 579, 584 (2007). The Court held that "the State is required to provide expert testimony . . . to explain the unique aspects of the [V.G.] and [M.P.] sexual assaults that would permit a jury to conclude that both crimes are the handiwork of the same person." Id. at 597. The State was also permitted "to present the bite-mark evidence in context and therefore material details of the [V.G.] sexual assault [could not] be censored," however, "[t]estimony describing that assault . . . is subject to specific jury instructions explaining the limited use of 'other crimes' evidence under N.J.R.E. 404(b)." Id. at 585. Lastly, the Court held that the State's experts must "provide defendant with a database of cases supporting" their testimony. Id. at 597-98.

In 2007 defendant was retried and convicted of murder, felony murder, and two counts of aggravated sexual assault. Although defendant's convictions carried a sentence of death, the death penalty was abolished in New Jersey prior to the penalty-phase trial. See N.J.S.A. 2C:11-3. After a penalty-phase trial before a new jury in 2010, defendant was sentenced to life without parole.[2] We affirmed defendant's conviction and sentence. State v. Fortin, No. A-1163-10 (App. Div. Oct. 20, 2015) (slip op. at 40-41), certif. denied, 224 N.J. 125 (2016).

Presented as an application for post-conviction relief in 2018, defendant moved for a new trial based on newly discovered scientific evidence regarding the reliability of bitemark evidence. He argued that since 2007, several wrongful convictions based on bitemark identification had been overturned and a consensus had emerged disproving the fundamental premise underlying the forensic discipline.

I. The State's 2007 case.

In August 1994, defendant and his then-girlfriend, Dawn Archer, resided at the Douglas Motel, located in the close vicinity of a QuickChek, Bud's Hut

[2] See State v. Fortin (Fortin IV), 198 N.J. 619, 632-33 (2009) (explaining why a penalty-phase trial was required and defendant's exposure to life without parole was appropriate.)

restaurant, and the Gem Motel, where M.P. resided with her boyfriend, Hector Fernandez, and her four young children.

On the evening of August 11, Archer and defendant walked to visit a friend, Charles Bennett, who lived south of the two motels. They stopped at the QuickChek to buy cigarettes, arriving at Bennett's apartment around 9:00 p.m. They all drank alcohol together until defendant and Archer began to argue, when Bennet asked them to leave at about 10:30 p.m.

According to Archer, they continued arguing after they left Bennett's apartment. Defendant became violent, threw her to the ground, and choked, kicked and cursed at her. She broke free and ran into Bud's Hut yelling: "Somebody call 911. He's beating me up." As Archer waited for the police, she left the restaurant "to see if [defendant] was still around" and saw him running back toward the Gem Motel.

Bennett testified that at about 11:15 p.m., defendant returned to his apartment looking for Archer. Bennett noticed that defendant, who was wearing shorts and a tank top, had scratches on his legs, but not on his face or arms. Bennett asked defendant how he got the scratches, and defendant replied that he had had a fight with Archer in the Bud's Hut parking lot.

At about the same time, M.P. left the Gem Motel and walked to the QuickChek to buy food for her family. A time-stamped receipt showed that at 11:29 p.m., M.P. purchased three cheese steak sandwiches and other food items. She then walked back towards the Gem Motel on the dirt trail commonly used by local residents.

When M.P. did not return, her boyfriend Fernandez became concerned and went to look for her. He found groceries and M.P.'s sandals strewn on the ground on the dirt trail to the QuickChek. As he bent down to pick up the sandals, he saw M.P., who was naked from the waist down, lying in one of the four uninstalled concrete sewer pipes that had been placed on the ground. He pulled her out of the pipe and attempted to revive her.

M.P.'s face was badly beaten, she had bloodstains on her face, arms, and hands and her shirt was soaked with blood. County investigators collected blood sample evidence, several loose hairs, and a Marlboro cigarette butt from inside the eight-and-one-half-foot-long pipe near M.P.'s body.

The investigators also found the groceries M.P. had purchased from the QuickChek on the ground near her body, including the three cheese steak sandwich containers, one of which was empty, a bloody dollar bill, and the time-stamped receipt. The police found M.P.'s shorts, with her underwear still inside,

hanging in a tree on a nearby street, and a partially eaten cheesesteak sandwich a short distance from the shorts.

Dr. Marvin Shuster, the chief medical examiner, arrived at the scene at 2:10 a.m. and determined that M.P.'s death had occurred approximately two hours earlier. Dr. Geetha Natarajan, who had been both Chief Medical Examiner for Middlesex County and Acting State Medical Examiner, testified that the cause of M.P.'s death was asphyxiation, assault and strangulation, and that she had sustained injuries consistent with manual strangulation, including a fractured hyoid bone, hemorrhaging on the subcutaneous tissue, and abrasions to her neck. M.P. also sustained numerous injuries as a result of blunt force trauma, including injuries to her eyes, bruises to her face, the inside of her lips and chest, and a fractured nasal bone. Although no traces of semen were found, Natarajan concluded that M.P. had been sexually assaulted and her multiple anal lacerations were consistent with forceful penetration by a finger or hand.

Natarajan further identified "two circular patterned abrasions on the left side of [M.P.'s] chin" as bitemarks, other "bitemarks on the upper quadrant of [her] left breast, and injury to her left nipple. Photos of the injury to M.P.'s left breast," one with her arm down and another with her arm extended, were taken. She testified that bitemarks were "uncommon" in sexual assault homicides, and

that in her thirty-years of experience as a medical examiner, in which she had performed between 6000 and 7000 autopsies and supervised four to five times that number, she had never seen that combination of bitemarks.

On August 13, 1994, Archer saw defendant for the first time since their altercation. She noticed that defendant had scratches on his face, neck and arm. Archer testified that she had not scratched defendant during their argument, and that defendant did not have the scratches when she last saw him two nights before. Archer and defendant later reunited and traveled to Maine, where defendant's parents lived.

About eight months later, on April 3, 1995, Maine State Trooper V.G. was off duty and driving home in a marked patrol car when she stopped to investigate a car parked on the shoulder facing in the wrong direction. The driver, later identified as defendant, produced a driver's permit and said he was lost. He could not find his registration or insurance. After detecting a strong odor of alcohol, V.G. asked him to take a seat in the front passenger side of her patrol car while she administered a series of sobriety tests. Defendant was initially "very cooperative." V.G. concluded that defendant was driving while under the influence and radioed for back-up assistance from an on-duty officer.

While waiting for back-up, V.G. and defendant "chitchat[ted]" as she wrote out his summonses. After defendant had been seated in the car for about forty-five minutes, he told V.G. that he had a "proposition" for her and suggested that she allow him to drive away and they "forget the whole thing." V.G. responded that the charges were serious and he would be arrested.

V.G. testified that defendant "just explode[d]," grabbed her around the neck, and hit her head against the door of the car, causing her to lose consciousness. When she woke, she was naked from the waist down and her shirt had been pulled up exposing her breasts. Her eyes were nearly swollen shut, her face and lips were swollen, her nose had been badly broken, her esophagus was bruised, her vagina and anus were sore, and she had bitemarks on her left breast and chin. Her vaginal bruising was consistent with the insertion of a finger or a thumb, and a large area of anal bruising was consistent with the insertion of multiple fingers or a thumb.

Defendant was arrested later that night and charged with kidnapping, aggravated assault, assault on an officer, and attempted gross sexual assault. State v. Fortin, 318 N.J. Super. 577, 589 (App. Div. 1999), aff'd, 162 N.J. at

535. He later pleaded guilty to all charges.[3] The Maine police found two packs of Marlboro cigarettes in defendant's car. As part of the investigation, the officers brought defendant to an orthodontist, who took photos and made stone cast and wax molds of defendant's teeth.

On April 24, 1995, the New Jersey police went to Maine to speak to defendant, who was in custody. Defendant waived his Miranda[4] rights and confirmed that he had been living with Archer at the motel in the summer of 1994. He recalled going to Bennett's residence with Archer on the evening of August 11, 1994, but denied assaulting her, although when confronted with the police report from that evening, he admitted that she may have fallen after he pushed her.

Defendant admitted that he read a newspaper account of M.P.'s murder but denied any involvement. The officers asked him about the scratches on his face that Archer had observed, which defendant claimed were old scars. He admitted smoking Marlboro cigarettes.

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[3] In November 1995, defendant was sentenced to an aggregate twenty-year term of imprisonment. Fortin, 318 N.J. Super. at 589. Evidence of defendant's assault of V.G. was admitted into evidence in New Jersey at both the guilt-phase and penalty-phase retrials under N.J.R.E. 404(b). Fortin, slip op. at 9.

[4] Miranda v. Arizona, 384 U.S. 436 (1966).

After an officer told defendant that the bitemarks on M.P. matched his dental records, defendant said: "If the evidence shows that I did it, it would probably be the reason, and I must have been involved, I don't remember." He also stated, "I'm not admitting anything. If the proofs show I did it, then I must have done it, I don't recall." He asked if he could be charged with manslaughter rather than murder and, if not, whether the officers could guarantee that he would not receive the death penalty. When the officers asked defendant for permission to record a formal, taped statement, defendant asked for an attorney and did not speak further.

In March 1995, Cellmark, a private lab, tested the cigarette butt found at the scene of M.P.'s murder, revealing two sources of DNA, an unknown primary donor, and a secondary or minor donor. In May 1995, after the V.G. assault, Cellmark received a sample of defendant's blood and retested the items. Defendant could not be ruled out as the primary source of the DNA on the cigarette butt. However, testing from 1994 of the saliva on the cigarette butt by the State Police Laboratory was positive for amylase, a constituent of saliva and blood group A, which was not consistent with either defendant's or M.P.'s blood type.

Ten years later, before the retrial, the State resubmitted the cigarette butt to Cellmark to conduct more powerful and sophisticated Y-STR (short tandem repeat on Y-chromosome) testing—testing unavailable in 1995. In 2005, polymerase chain reaction and Y-STR testing confirmed that defendant was the primary contributor to the DNA obtained from the cigarette butt; the frequency for that result was one in ten quadrillion thereby virtually eliminating any other source of the DNA. Cellmark could not reconstruct M.P.'s DNA, and thus could not determine if she was the secondary source of DNA on the cigarette butt.

Several experts testified on behalf of the State at trial with regard to the bitemark evidence. Hazelwood, the State's expert in violent criminal behavior, did not testify as he had in the first trial about the unique similarities between the M.P. and V.G. assaults. He instead testified that every violent sexual crime has a modus operandi and the motivation is power and anger. Some sexual assault cases involve ritualistic behavior, and in a few cases a "signature," or a "unique combination of behaviors" run across a series of crimes.

Adam J. Freeman, D.D.S., the State's expert in forensic odontology, who although not yet board certified in forensic dentistry, was Director of the Forensic Dentistry Program at Columbia University, a member of various professional organizations and the author of a number of scientific publications,

testified as to the rarity of the combination of chin and breast bitemarks alone. His testimony focused on an analysis he had conducted in 2003 on the results of a survey he sent to 1100 forensic dentists in twenty-six countries. See Adam J. Freeman et al., Seven Hundred Seventy Eight Bitemarks: Analysis by Anatomic Location, Victim and Biter Demographics, Type of Crime, and Legal Disposition, 50 J. Forensic Sci. 1436 (Nov. 2005). No cases in the survey reported bitemarks to the breast and the chin only. Freeman agreed that bitemarks to the breast were relatively common in sexual assault cases, but bitemarks to the chin were not. No more than five cases involving bites to the chin were reported in the survey.

Lastly, Dr. Lowell J. Levine, an American Board of Forensic Odontology (ABFO) Diplomate and board certified forensic odontologist, opined within a reasonable degree of scientific certainty that based on his review of the autopsy photos, M.P. had a bitemark on her left breast and multiple bitemarks on her chin. Levine compared the bitemarks to the impressions taken of defendant's teeth and concluded that the bitemarks on M.P.'s chin were consistent with having been caused by defendant, the injury to her nipple was consistent with a bitemark but he could not determine if it was caused by defendant, and that if M.P.'s arm was raised when the bitemarks to her breast occurred "then there is

a high degree of probability within reasonable scientific certainty it was done by [defendant]." If her arm was not raised, Levine concluded that the bitemark "could have been done by [defendant]," but he could not make that determination with "a high degree of probability."

Levine also found, within a reasonable degree of scientific certainty, that V.G. had multiple bitemarks on her chin and an egg-shaped bitemark on her left breast. The injury to her left nipple was consistent with having been caused by teeth, but he could not make that determination "with reasonable scientific certainty." He compared the bitemarks to the molds of defendant's teeth and concluded that defendant could have caused the bitemarks to V.G.'s chin, and that the bitemarks to her breast were "consistent" with defendant. Levine emphasized that while he could not "say with certainty [defendant] did it," he could not "exclude [defendant] either."

Levine demonstrated for the jury how he made the comparisons by placing the edges of the model of defendant's teeth over the injury pattern depicted on the photos of M.P.'s and V.G.'s bitemarks, and then finding points of similarities between the model and the photos. He explained that bitemarks become visible through bruises that exhibit certain characteristics.

He stated that bitemark comparison theory is based on the idea that every individual has a unique set of teeth. He demonstrated that fact by comparing the mold of defendant's upper teeth, which were very straight with spaces between them, to the molds of three other individuals' teeth. He admitted it was not a precise science.

Defense counsel questioned Levine about a previous case in which he testified that the bitemarks were to "a high degree of probability" caused by the defendant, but DNA evidence had exonerated that defendant.

II. The defense at trial.

Dr. Norman D. Sperber, a practicing dentist, forensic odontologist and ABFO Diplomate, testified as an expert in forensic odontology for the defense. Sperber testified that bitemark analysis has several serious limitations because skin is a poor medium for recording the pattern of teeth because it is "very movable" and "very unstable." He explained that skin is elastic and thus indentations made by teeth will rebound, leaving a mark smaller than the biter's teeth. Further complicating the analysis, bitemarks are generally bruises consisting of the diffusion of blood under the skin, and therefore do not accurately depict teeth marks.

In contrast to identification by dental x-rays and DNA analysis, he maintained that bitemark evidence was not reliable nor a "true science" and was more useful in excluding than identifying suspects. He testified that bitemark analysis testimony had been responsible for many cases of misidentification, including a case in Arizona against a defendant, who had been nicknamed "the snaggletooth killer," and was eventually exonerated by DNA evidence.

Despite his reservations about the reliability of bitemark evidence, he reviewed the autopsy photos and determined that the lesion on M.P.'s chin was "probably" a bitemark, but that the one on her breast was most likely not. Sperber demonstrated how he superimposed the overlay of defendant's bite pattern over the photograph of the marks on M.P.'s chin and breast, pointed out how the overlay and photograph did not match, and testified that based on that comparison, he concluded that defendant was "excluded absolutely" from having made the bitemarks. Sperber admitted, however, that he had not reviewed V.G.'s bitemarks. He also admitted that he had testified in another case that bitemark evidence was helpful and reliable.

Dr. Robert C. Shaler, Ph.D., the defense expert in DNA analysis, agreed with Cellmark's conclusion that defendant was the primary source of the DNA

on the cigarette butt, but testified that he had concluded that based on M.P.'s partial virtual DNA profile, she was not the secondary source of the DNA.

III. Motion for a new trial.

In support of his motion for a new trial, defendant submitted a certification and report by Dr. Charles M. Bowers, a board certified forensic odontologist, who opined that as a result of "the advancement of science since [the retrial in] 2007," Levine's testimony was "irretrievably flawed," and the admission of bitemark evidence "would not now be considered acceptable as a means of human identification."

Bowers set forth that Levine, as an ABFO Diplomate, was subject to the ABFO standards and guidelines relating to bitemark evaluations. He maintained that under the revised ABFO guidelines, Levine's 2007 testimony at defendant's retrial that there was a "high degree of probability within reasonable scientific certainty" that a bitemark was caused by a specific individual was no longer permitted.[5] The revised guidelines limited bitemark linkage testimony to a

[5] A revised 2018 Guideline provides that an ABFO Diplomate is prohibited from expressing a conclusion "unconditionally linking a bitemark to a dentition." See American Board of Forensic Odontology (ABFO), Standards and Guidelines for Evaluating Bitemarks (rev. Feb. 19, 2018), http://abfo.org/wp-content/uploads/2012/08/ABFO-Standards-Guidelines-for-Evaluating-Bitemarks-Feb-2018.pdf [hereinafter ABFO Guidelines].

conclusion that: "1) the suspect cannot be excluded[;] 2) the suspect is excluded[;] or 3) there is insufficient evidence for analysis." He claimed that those changes were "due to the growing number of DNA exonerations" since defendant's 2007 retrial.

According to Bowers, "[t]he record of wrongful convictions associated with bitemark identification opinions has expanded extensively since . . . 2007." "As of 2018, there have been [twenty-eight] exonerations, case dismissals, and incarceration releases, where the wrongful conviction of indictment originally rested on bitemark evidence." Bowers had been involved in nine of those exonerations. Levine had been involved in two known wrongful convictions and indictments. Bowers emphasized that "[c]ases where defendants have been exonerated after [f]orensic dentists have, at trial, used the same terminology, techniques and non-science based assumptions" as Levine.

Bowers set forth that since 2007, a number of independent scientific bodies have rejected the scientific basis used in bitemark analysis. First, Bowers cited to a 2009 report by the National Academy of Science (NAS), a private, nonprofit scientific society that advises the federal government on scientific and technical matters, which addressed the scientific validity of several forensic disciplines, including bitemark evidence. See Nat'l Research Council of the

Nat'l Academies, Strengthening Forensic Science in the United States: A Path Forward 173-76 (2009).[6] In its report, the NAS stated that: "Although the identification of human remains by their dental characteristics is well established in the [f]orensic science disciplines, there is continuing dispute over the value and scientific validity of comparing and identifying bitemarks." Id. at 173 (footnote omitted).

The NAS listed the following basic problems inherent in bitemark analysis and interpretation:

> (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 bitemark 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.
>
> (3) A standard for the type, quality, and number of individual characteristics required to indicate that a

[6] The full report is available at https://www.ncjrs.gov/pdffiles1/nij/grants/228091.pdf.

bitemark has reached a threshold of evidentiary value has not been established.

[Id. at 175-76 (footnotes omitted).]

The NAS summarized its assessment of bitemark analysis as follows:

> Despite the inherent weaknesses involved in bitemark comparison, it is reasonable to assume that the process can sometimes reliably exclude suspects. Although the methods of collection of bitemark evidence are relatively noncontroversial, there is considerable dispute about the value and reliability of the collected data for interpretation. Some of the key areas of dispute include the accuracy of human skin as a reliable registration material for bitemarks, the uniqueness of human dentition, the techniques used for analysis, and the role of examiner bias. The ABFO has developed guidelines for the analysis of bitemarks in an effort to standardize analysis, but there is still no general agreement among practicing forensic odontologists about national or international standards for comparison.
>
> Although the majority of forensic odontologists are satisfied that bitemarks can demonstrate sufficient detail for positive identification, no scientific studies support this assessment, and no large population studies have been conducted. In numerous instances, experts diverge widely in their evaluations of the same bitemark evidence, which has led to questioning of the value and scientific objectivity of such evidence.
>
> Bitemark testimony has been criticized basically on the same grounds as testimony by questioned document examiners and microscopic hair examiners. The committee received no evidence of an existing scientific basis for identifying an individual to the

> exclusion of all others. That same finding was reported in a 2001 review, which "revealed a lack of valid evidence to support many of the assumptions made by forensic dentists during bitemark comparisons." Some research is warranted in order to identify the circumstances within which the methods of forensic odontology can provide probative value.
>
> [Id. at 176 (emphasis added) (footnotes omitted).]

Second, Bowers cited to a series of published scientific articles in which the authors, like defense expert Sperber, concluded that dentition is not unique and that human skin cannot accurately record human dentition. See Mary A. Bush et al., Statistical Evidence for the Similarity of the Human Dentition, 56 J. Forensic Sci. 118 (2011) ("statements of dental uniqueness with respect to bitemark analysis in an open population are unsupportable"); 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) ("[r]esults of studying these populations show that dental matches can occur, and that statements of certainty concerning individualization in such populations should be approached with caution"); Mary A. Bush et al., Similarity and match rates of the human dentition in three dimensions: relevance to bitemark analysis, 125 Int. J. Leg. Med. 779 (2011) ("study suggests that there may not be a scientific basis for a general expression of dental

uniqueness when the incisal edges of the six anterior teeth are considered"); Mary A. Bush et al., Inquiry into the Scientific Basis for Bitemark Profiling and Arbitrary Distortion Compensation, 55 J. Forensic Sci. 976 (2010) ("bitemark profiling and arbitrary distortion compensation may be inadvisable").

Third, Bowers referenced a 2016 report by the Texas Forensic Science Commission (TFSC), a statutorily created body tasked with managing accredited forensic disciplines and ensuring the integrity and reliability of forensic evidence in Texas criminal courts. See Texas Forensic Sci. Comm'n, Forensic Bitemark Comparison Complaint Filed by National Innocence Project on Behalf of Steven Mark Chaney 1-17 (Apr. 12, 2016) (the TFSC Report).[7] In its report, the TFSC made two threshold findings: (1) "there is no scientific basis for stating that a particular patterned injury can be associated to an individual's dentition" and (2) "there is no scientific basis for assigning probability or statistical weight to an association." Id. at 11-12.

The TFSC concluded that "[a]t the current time, the overwhelming majority of existing research does not support the contention that bitemark comparison can be performed reliably and accurately from examiner to examiner

[7] Available at https://www.txcourts.gov/media/1440871/finalbitemarkreport.pdf.

due to the subjective nature of the analysis." Id. at 12. In reaching that conclusion, the TFSC found of "tremendous concern" a 2015 study titled, Construct validity of bitemark assessments using the ABFO Decision Tree, coauthored by Freeman, one of the State's experts. TFSC Report at 12. In that study, the authors asked ABFO Diplomates to review photographs of 100 patterned injuries. Id. at 13. "The study revealed an enormous spread of decisions among the Diplomates on the basic question of whether the patterned injury was in fact a bitemark." Ibid.

> The TFSC recommends that bitemark comparison not be admitted in criminal cases in Texas unless the following are established:
>
> 1. Criteria for identifying when a patterned injury constitutes a human bitemark. This criteria should be expressed clearly and accompanied by empirical testing to demonstrate sufficient inter and intra-examiner reliability and validity when the criteria are applied.
>
> 2. Criteria for identifying when a human bitemark was made by an adult versus a child. This criteria should be expressed clearly and accompanied by empirical testing to demonstrate sufficient inter and intra-examiner reliability and validity when the criteria are applied.
>
> 3. Rigorous and appropriately validated proficiency testing using the above criteria.
>
> 4. A collaborative plan for case review including a multidisciplinary team of forensic odontologists and attorneys.

[Id. at 15-16.]

Lastly, Bowers cited to a September 2016 report by the President's Council of Advisors on Science and Technology (PCAST). See President's Council of Advisors on Science and Technology, Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods (Sept. 20, 2016) (the PCAST Report).[8] The PCAST Report concluded that "[f]ew empirical studies have been undertaken to study the ability of examiners to accurately identify the source of a bitemark. Among those studies that have been undertaken, the observed false positive rates were so high that the method is clearly scientifically unreliable at present." Id. at 87.

PCAST cited to an Australian study[9] where fifteen odontologists were asked to comment "about six images of supposed bitemarks, [which resulted in] wide-ranging opinions among the practitioners on the origin, circumstance, and characteristics of the patterned injury for all six images." Id. at 85. The study found that "[s]urprisingly, [odontologists] with the most experience . . . tended

[8] https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/PCAST/pcast_forensic_science_report_final.pdf.

[9] Page M. Taylor & M. Blenkin, Expert interpretation of bitemark injuries – a contemporary qualitative study, 58 J. Forensic Sci. 664 (May 2013).

to have the widest range of opinions as to whether a mark was of human dental origin or not." Ibid.

Bowers concluded that "[t]he totality of these scientific advances present a clear and compelling certainty that the bitemark testimony used in [defendant's 2007 retrial] is now considered flawed and insufficient to meet current standards for scientific admissibility."

The Innocence Project (IP) submitted a brief in support of defendant's motion, arguing that defendant was entitled to a new trial "untainted by the grossly unreliable bitemark evidence originally introduced against him." IP stated that a scientific consensus doubting the fundamental premises of the field had emerged, concluding that forensic odontologists cannot reliably 1) identify injuries as bitemarks because skin is an unreliable medium, 2) associate a bitemark with the teeth of an individual and 3) quantify the probability of the match. IP argued that after defendant's retrial in 2007, "every neutral scientific body to have examined bitemarks has rejected it as entirely unreliable," citing to the 2009 NAS Report, the TFSC Report, the PCAST Report, and the revised ABFO Guidelines.

In opposition to the motion, the State cited to a series of reports by various associations that were highly critical of the PCAST Report for disregarding large

bodies of scientific evidence and legal precedence, discrediting the courtroom process to test the admissibility and weight of forensic evidence, and calling for an end to the use of most forensic evidence in criminal investigations and prosecutions. See, e.g., Jack D. Roady, The PCAST Report: A Review and Moving Forward—A Prosecutor's Perspective, 32:1 Crim. Just. 9 (2017).

Then-Attorney General Loretta Lynch did not adopt the PCAST Report recommendations, reasoning, that "when used properly, forensic science evidence helps juries identify the guilty and clear the innocent, and the department believes that the current legal standards regarding the admissibility of forensic evidence are based on sound science and sound legal reasoning." Id. at 13 (quoting Gary Fields, White House Advisory Council Report Is Critical of Forensics Used in Criminal Trials; U.S. Attorney General says Justice Department won't adopt recommendations, Wall St. J., Sept. 20, 2016).

The State also argued that the list of cases cited by Bowers as examples of wrongful convictions due to bitemark evidence were distinguishable because "none of [those] cases . . . involved facts like those in this case, which include two sets of bitemarks on different victims, one set of which [was known to come] from defendant." In addition to the bitemark evidence, defendant's DNA was on the cigarette butt found in the pipe at the crime scene. Thus, the State

maintained that the key evidence in this case was both the bitemark and the DNA evidence. The State also argued that this was not newly discovered evidence because the reliability of the bitemark evidence was raised at the 2007 trial and could have been raised on direct appeal.

Defendant raises the following issues on appeal:

> POINT I: NEW SCIENTIFIC EVIDENCE HAS EMERGED SINCE THE TIME OF DEFENDANT'S TRIAL THAT DEMONSTRATES THAT BITEMARK ANALYSIS IS NOT A SCIENTIFICALLY VALID DISCIPLINE AND HAS NO PLACE IN THE COURTROOM. THAT SCIENTIFIC EVIDENCE CONSTITUTES NEWLY DISCOVERED EVIDENCE. ON THE BASIS OF THAT EVIDENCE, WHICH IS MATERIAL TO DEFENDANT'S GUILT, DEFENDANT IS ENTITLED TO A NEW TRIAL.
>
> A. THE NEW SCIENTIFIC UNDERSTANDING THAT BITEMARK ANALYSIS IS UNRELIABLE AND ITS WIDESPEAD REJECTION AMONG SCIENTISTS OF THE FIELD IS NEWLY DISCOVERED EVIDENCE THAT COULD NOT HAVE BEEN DISCOVERED AT THE TIME OF TRIAL.
>
> B. THE NEW SCIENTIFIC UNDERSTANDING THAT BITEMARK ANALYSIS IS UNRELIABLE AND NOT GENERALLY ACCEPTD IS MATERIAL TO DEFENDANT'S GUILT. IN A NEW TRIAL WHERE THE BITEMARK EVIDENCE WERE PROPERLY EXCLUDED, THE JURY'S VERDICT WOULD PROBABLY BE DIFFERENT.

C. IN THE ALTERNATIVE, THE CASE SHOULD BE REMANDED FOR AN EVIDENTIARY HEARING ON THE NEWLY DISCOVERED EVIDENCE.

IV. Denial of motion for new trial.

Defendant argues that the trial court erred in denying his motion for a new trial on the basis of newly discovered evidence on the reliability and scientific validity of bitemark analysis. Rule 3:20 provides that a defendant's motion for new trial may be "made at any time" and should be granted "if required in the interest of justice."

"[A] defendant may seek a new trial where advances in scientific methodology previously unavailable would likely have changed the result." State v. Armour, 446 N.J. Super. 295, 305 (App. Div. 2016). That is because "[s]cience moves inexorably forward and hypotheses or methodologies once considered sacrosanct are modified or discarded. The judicial system, with its search for the closest approximation to the 'truth,' must accommodate this ever-changing scientific landscape." State v. Behn, 375 N.J. Super. 409, 429 (App. Div. 2005).

"[T]o qualify as newly discovered evidence entitling a party to a new trial, the new evidence must be (1) material to the issue and not merely cumulative or impeaching or contradictory; (2) discovered since the trial and not discoverable

by reasonable diligence beforehand; and (3) of the sort that would probably change the jury's verdict if a new trial were granted." State v. Carter, 85 N.J. 300, 314 (1981). "All three [prongs of the] test[] must be met before the evidence can be said to justify a new trial." Carter, 85 N.J. at 314. "The defendant has the burden to establish each prong is met." State v. Smith, 29 N.J. 561, 573 (1959).

We review a motion for a new trial decision for an abuse of discretion. Armour, 446 N.J. Super. at 306. Questions of law are reviewed de novo. State v. Miles, 229 N.J. 83, 90 (2017).

In denying defendant's motion for a new trial, the trial court found under prong two of the Carter test that this was not "newly discovered evidence." The court reasoned that although the ABFO Guidelines and some of the other information, including the 2009 NAS Report, the TFSC Report, and the PCAST Report, had been published after defendant's retrial in 2007, the substance of the reports was not "new" in that "the jury was made aware of the problems of bitemark evidence" through the testimony of Levine and Sperber. The court also found that the supporting evidence cited by Bowers could have been raised much earlier than 2018.

Under prongs one and three, the court found that the State's case against defendant was "extremely strong in terms of circumstantial evidence," notably that defendant's DNA was on the cigarette butt found in the pipe where M.P. was murdered, and defendant was in the area at the time and was scratched, and thus he was not convicted solely on the bitemark evidence. The court also found that the impact of the expert testimony on bitemark analysis was mitigated because "Levine was very conservative in his approach," and the jury was able to see the actual comparisons between the bitemarks and the molds of defendant's teeth.

A. Prong two of the Carter test.

"Prong two of the Carter test recognizes that judgments must be accorded a degree of finality and, therefore, requires that the new evidence must have been discovered after completion of trial and must not have been discoverable earlier through the exercise of reasonable diligence." State v. Ways, 180 N.J. 171, 192 (2004). "The defense must 'act with reasonable dispatch in searching for evidence before the start of the trial.'" State v. Nash, 212 N.J. 518, 550 (2013) (quoting Ways, 180 N.J. at 192). "R[ule] 3:20-2 presents a viable means by which a defendant can seek a new trial" based on newly discovered scientific evidence "if he [or she] can now show that recently improved scientific

methodology, not available at the time of trial, would probably have changed the result." State v. Halsey, 329 N.J. Super. 553, 559 (App. Div. 2000).

For example, in Behn, the defendant, who was convicted of felony murder in 1997, moved for a new trial based on newly discovered evidence regarding bullet lead composition. 375 N.J. Super. at 413-14. At trial, the State's expert in bullet lead composition analysis, "[Charles] Peters testified that each source of lead used by a bullet manufacturer is unique and that there are millions of different sources of lead." Id. at 420. He stated that a comparison of the bullet fragments recovered from decedent's body with bullets found in defendant's possession revealed that they were "analytically, indistinguishable." Id. at 421. He found "the fragments either came from the same box of bullets as those found in defendant's possession or other boxes that were manufactured on 'the same day' from the 'same source' of lead." Ibid. The defense "was not able to obtain an expert to refute the opinions of Peters, and ultimately Peters' trial testimony stood unrebutted." Id. at 419.

We determined that the results of studies conducted by forensic metallurgists after the defendant's trial, "was newly discovered." Id. at 429. We cited to affidavits submitted in support of the motion in which the metallurgists stated that it "was not known until late 2002 that there existed no valid and

relevant database of bullet compositions, nor any meaningful or comprehensive studies, to permit interpretation of the forensic significance of an alleged 'match' of bullet compositions." Id. at 426. Thus, "no amount of reasonable diligence could have uncovered this information, since it did not exist previously." Id. at 429. Further, whatever any other experts, including those mentioned in two other prior out-of-state cases, "might have been able to say on the subject, none could have refuted Peters' testimony in the way that [the metallurgists] could, since the basis for the impeachment did not exist in April 1995 when defendant's trial was conducted." Ibid. (footnote omitted). See also Armour, 446 N.J. Super. at 312 (noting that given the undisputed advances in fingerprint identification systems, the evidence "would not have been reasonably discovered prior to or during trial").

Similarly, in State v. Peterson, 364 N.J. Super. 387, 390-91 (App. Div. 2003), the defendant brought a motion to obtain post-conviction forensic DNA testing of evidence under N.J.S.A. 2A:84A-32a. We held that the DNA testing qualified as newly discovered evidence "even though some early forms of DNA testing were in use at the time of defendant's trial in 1989, [because] DNA testing has become more common and more reliable in the intervening fourteen years." Id. at 398. We were satisfied that the DNA testing "was not 'discoverable by

reasonable diligence before defendant's trial.'" Ibid. (quoting Carter, 85 N.J. at 314).

In contrast, here, evidence was presented at trial on the substance of all of the new reports, except the revised ABFO Guidelines. For example, in conformance with the 2009 NAS Report and PCAST Report, Sperber testified that bitemark analysis was not reliable or a "true science." Sperber also testified, in conformance with a series of scientific articles, that bitemark comparison analysis had serious limitations because skin is "very movable," and thus does not accurately depict teeth marks. Further, Levine admitted that forensic odontology was "an art based on science," and that unless an individual had a "totally bizarre tooth," he "couldn't say with a hundred percent certainty that somebody caused a particular bitemark." In conformance with Bowers' certification, both Levine and Sperber also testified that bitemark analysis testimony had been responsible for cases of misidentification. Sperber also testified that defendant was "excluded absolutely" from having made the bitemarks on M.P.'s chin and breast.

Furthermore, at the time of the retrial in 2007, scientific articles critical of bitemark analysis evidence had been published, including a 2006 article by Bowers, and thus the substance of the new reports could have been discovered

through reasonable diligence. See C.M. Bowers, Problem-based analysis of bitemark misidentifications: The role of DNA, Forensic Sci. Int., 159 Supp. 1 (2006) ("dental literature concerning bitemark methodology is surprisingly thin and sorely lacking in rigorous scientific testing"); D.K. Whittaker, Some laboratory studies on the accuracy of bitemark comparison, 25 Int'l Dent. J. 166 (1975) (suggesting that because identification of bitemarks on pig skin was unreliable, similar difficulties may be encountered in identifying bites on human skin); I.A. Pretty & D. Sweet, The scientific basis for human bitemark analyses—a critical review, 41 Sci. & Justice 85 (2001) ("review revealed a lack of valid evidence to support many of the assumptions made by forensic dentists during bitemark comparisons"); I.A. Pretty, A web-based survey of odontologists' opinions concerning bitemark analyses, 48 J. Forensic Sci. 1117 (2003) ("survey[ing] forensic dentists to obtain their views on a number of crucial components of bitemark theory and contentious areas within the discipline").

The only entirely new evidence in this case was the 2016 revision to the ABFO Guidelines. The revised ABFO Guidelines provide that "[a]n ABFO Diplomate shall not express conclusions unconditionally linking a bitemark to a dentition." See ABFO Guidelines at 1. They also provide that an odontologist

should use only the following terms linking a dentition to a human bitemark: "[e]xcluded as [h]aving [m]ade the [b]ite[]mark"; "[n]ot [e]xcluded as [h]aving [m]ade the [b]ite[]mark"; and "[i]nconclusive." Id. at 3-4. "Stronger terms of attribution are not condoned by the ABFO." Id. at 5. Although the Guidelines have changed, in itself that change does not satisfy the second prong of the Carter analysis.

B. Prongs one and three of the Carter test.

Prong one of the Carter test provides that the new evidence must be "material to the issue and not merely cumulative or impeaching or contradictory." Carter, 85 N.J. at 314. Evidence is material if it "'would have some bearing on the claims being advanced,' and includes evidence that supports a general denial of guilt." Nash, 212 N.J. at 549 (quoting Ways, 180 N.J. at 188). "Determining whether evidence is 'merely cumulative, or impeaching, or contradictory,' and, therefore insufficient to justify the grant of a new trial requires an evaluation of the probable impact such evidence would have on a jury verdict." Ways, 180 N.J. at 188-89 (quoting Carter, 85 N.J. at 314).

In that regard, prongs one and three are "inextricably intertwined." Nash, 212 N.J. at 549.

> Therefore, the focus properly turns to prong three of the Carter test, whether the evidence is "of the sort that

> would probably change the jury's verdict if a new trial were granted." Carter, 85 N.J. at 314. The characterization of evidence as 'merely cumulative, or impeaching, or contradictory' is a judgment that such evidence is not of great significance and would probably not alter the outcome of a verdict. Ibid. However, evidence that would have the probable effect of raising a reasonable doubt as to the defendant's guilt would not be considered merely cumulative, impeaching, or contradictory. Ibid.
>
> [Ways, 180 N.J. at 189.]

"The power of the newly discovered evidence to alter the verdict is the central issue . . . ." Id. at 191-92. The evidence must be "evaluated in light of the . . . corroborative proofs in the record." See State v. Herrerra, 211 N.J. 308, 343 (2012). "[T]he third prong of Carter presents a mixed question of law and fact, requiring that we give deference to 'supported factual findings of the trial court, but review de novo the lower court's application of any legal rules to such factual findings.'" Behn, 375 N.J. Super. at 432 (quoting State v. Harris, 181 N.J. 391, 416 (2004)).

Under the first prong of the Carter test, the new evidence—the NAS Report, ABFO Guidelines, TFSC Report, PCAST Report and the various studies—is clearly material to the bitemark evidence, which was a "focal issue of the trial and must be considered material." See State v. Henries, 306 N.J. Super. 512, 531 (App. Div. 1997). The State focused on this evidence in its

opening and closing arguments, and presented four witnesses who testified about bitemarks: Hazelwood, Natarajan, Freeman and Levine.

However, with the exception of the ABFO Guidelines, the new evidence was cumulative, in that comparable evidence impeaching the bitemark evidence and exonerations in other cases based on such evidence was offered at trial. The impact of this "new" evidence was "not of great significance and would probably not alter the outcome of a verdict." See Ways, 180 N.J. at 189. Because the new evidence would not "effectively neutralize[] the State's expert testimony," this situation stands in direct contrast to Behn. See 375 N.J. Super. at 433.

Further, even though the revised ABFO Guidelines are new, under prong three, the imposition of those guidelines are not "of the sort that would probably change the jury's verdict if a new trial was granted." Carter, 85 N.J. at 314. Under the revised ABFO Guidelines, Levine could not "express conclusions unconditionally linking a bitemark to a dentition." ABFO Guidelines at 1. During a new trial he would likely be limited to testifying that defendant's dentition is "[n]ot [e]xcluded as [h]aving [m]ade the [b]itemark" to both M.P. and V.G. ABFO Guidelines at 4. The jury knew, however, that defendant caused the injuries to V.G. because he pled guilty to the crimes against V.G. in Maine.

Under the new guidelines, ABFO Diplomates may identify a mark as a human bitemark and can testify as to the rarity of a certain combination of bitemarks. Thus, Levine could still testify that the marks on M.P.'s and V.G.'s chin and left breast were bitemarks; Natarajan, who was not an ABFO Diplomate, could still identify the marks on M.P.'s chin and left breast as bitemarks and could testify that in her thirty years' experience she had never seen that combination of bitemarks; and Freeman could still testify as to the results of his survey in which he found no cases that reported bitemarks to just the chin and the breast. As a result, although the jury would be presented at a new trial with less definitive testimony by Levine linking the bitemarks to defendant, the jury would still hear evidence that defendant could not be excluded as having caused the bitemarks and that the combination of bitemarks was highly unusual. The new ABFO Guidelines would not preclude the admission of the N.J.R.E. 404(b) evidence of defendant's sexual assault of V.G.

Levine's testimony was, as the trial court found, "conservative" and did not unconditionally link the bitemarks to defendant. Moreover, as the trial court found, there was other strong evidence in this case besides the bitemark evidence, notably, defendant's DNA on the cigarette butt found inside the pipe where M.P. was killed. His attack on Archer placed him in the area at the time

of the murder, he had unexplained scratch marks on his face, neck and arms the night of the murder, he was agitated and angry with Archer at the time of M.P.'s murder, and he committed a very similar and highly unusual assault against V.G. just months after M.P.'s murder.

Lastly, bitemark evidence is currently admissible in New Jersey. State v. Timmendequas, 161 N.J. 515, 624 (1999), cert. denied, 534 U.S. 858 (2001). As defendant conceded, despite the evolving criticism by the scientific community as to the reliability of this evidence, to date no court in the United States has excluded expert testimony on bitemark identification. See Michael A. Saks et al., Forensic bitemark identification: weak foundations, exaggerated claims, 3 J. Law Biosci. 538 (2016). Courts have criticized the discipline, and overturned convictions based on DNA evidence or repudiated testimony, but have not overruled cases allowing admission. See In re Richards, 371 P.3d 195, 207-08 (Cal. 2016) (overturning the defendant's conviction where Sperber clearly repudiated his trial testimony that the autopsy photograph depicted a human bitemark). Defendant failed to establish any of the three prongs of the Carter test. The trial court did not abuse its discretion in denying the motion for a new trial.

C. Evidentiary hearing.

Defendant argues in the alternative that the motion judge erred in failing to conduct an evidentiary hearing on the reliability of the bitemark identification evidence. Our Supreme Court has held that bitemark identification evidence satisfies the requirements for admission under N.J.R.E. 702, Fortin III, 189 N.J. at 593-94, 608-09, and the motion court properly considered the new reports in addressing defendant's motion for a new trial. A more extensive evidentiary hearing was not required.

Affirmed.