

Commonwealth vs. Justin Joyner
SJC-11349

Plymouth, October 8, 2013 - February 14, 2014

Indictment found and returned in the Superior Court Department on March 2, 2010.

The case was tried before *Merita A. Hopkins, J.*

Indictments found and returned in the Superior Court Department on May 2, 2003, and May 23, 2003.

A proceeding for revocation of probation was heard by *Merita A. Hopkins, J.*

The Supreme Judicial Court granted an application for direct appellate review.

Emily A. Cardy, Committee for Public Counsel Services, for the defendant.
Carolyn A. Burbine, Assistant District Attorney, for the Commonwealth.

Present: Ireland, C.J., Spina, Cordy, Botsford, Gants, Duffly, & Lenk, JJ.

DUFFLY, J.

A latent fingerprint left by a masked intruder who had demanded the contents of the cash register at a Brockton gasoline station convenience store led to the defendant's arrest for armed robbery. The defendant was thereafter convicted by a Superior Court jury of armed robbery, G.L. c. 265, § 17. The defendant appeals from his conviction and from the revocation of his probation which resulted therefrom. The defendant's principal claim on appeal concerns the fingerprint evidence, which was the primary evidence tying him to the crime. He argues that the Commonwealth was required to, but did not, present evidence of the standard used to match fingerprints and the statistical significance of a fingerprint match in accurately identifying an individual and, therefore, that the fingerprint evidence was insufficient to prove beyond a reasonable doubt that the defendant was the robber. The defendant argues also that his conviction must be overturned because there was no evidence of force, a required element of armed robbery, [FN1] and because the prosecutor misstated the evidence in her closing argument, creating a substantial risk of a miscarriage of justice. Additionally, the defendant contends that his due process rights were violated when the trial judge, who conducted a probation revocation hearing after the trial, prohibited him from presenting evidence on his own behalf. We affirm the conviction and conclude also that there was no error in the revocation of the defendant's probation.

Background

The evidence would have warranted the jury in finding the following. [FN2] On the night of November 29, 2009, Kentoria Alexander was working as a cashier at a gasoline station convenience store in Brockton. Alexander was the only employee working at that time, and no customers were in the store or at the gasoline pumps. A man who was approximately six feet one or two inches tall walked into the store wearing a "hoodie"; because the hood was up and a bandana was tied around his face, Alexander could see only the man's eyes and exposed hands. Alexander "wasn't looking at the man's eyes too much," but he saw that the skin color of the man's hands was light, although not pale white. The man pulled out a gun and demanded the money from the cash register. Alexander took the cash drawer out of the cash register and threw it on the counter. The man picked up the drawer with his ungloved right hand; he walked to the door, stopped and removed the money from the cash drawer, then returned and put the drawer back on the counter before leaving. After the robber left, Alexander telephoned 911 and reported the incident.

Two police officers arrived at the scene soon thereafter. Officer Ruben Delvalle, who spoke with Alexander about the incident, described Alexander's demeanor as "a little nervous explaining what happened," and reported that Alexander spoke "kind of fast." Delvalle also observed an empty cash drawer in the center of the counter, and asked to view the store's surveillance footage. The store's owner, Ghazi Saab, was contacted; when he arrived, he and the officers viewed the video surveillance footage. [FN3]

Based on the surveillance footage, the officers "had an idea" as to "where the suspect touched the drawer," and the fingerprints were recovered "from those areas." Only those investigating the crime scene had access to the drawer after officers arrived on the scene. A Plymouth County deputy sheriff employed by the Bureau of Criminal Investigations (BCI) placed the cash drawer in an evidence bag and brought it to the BCI laboratory, where it was processed for latent fingerprints by Jason Molino, a forensic support analyst. [FN4] Molino obtained four fingerprints that he believed to be of sufficiently good quality to permit comparison analysis. According to Molino, a certain number of "points" must be obtained from a fingerprint before it can go into the Automatic Fingerprint Identification System (AFIS), a fingerprint database. Molino took two "lifts" of a fingerprint which he obtained from the back of the drawer and marked as "latent No. 4." This print was run through AFIS, and returned a possible match. Robert Foley, a former director of the BCI laboratory in Plymouth, then examined latent No. 4 and compared it with a rolled fingerprint of the defendant's right thumb.

Saab had owned the gasoline station convenience store since 1997 and had replaced the store's cash register with a new one in 2009, before the November, 2009, robbery. The only individual permitted to touch the cash drawer at any given time was the shift employee. The defendant had

never worked for Saab and, to Saab's knowledge, no customer had ever touched the cash drawer in the time he owned the store. Alexander had never worked with the defendant at the store, nor had he ever seen the defendant in the store in the seven months he had worked there.

At trial, the defendant was instructed to display his hands to the jury. Based on their observations of the defendant, the jury could have inferred that he was the same height as the perpetrator and had the same skin tone. [FN5] However, because the perpetrator wore a mask and was not otherwise identified on the basis of distinctive physical characteristics, the primary evidence linking the defendant to the robbery was expert testimony concerning the fingerprints recovered from the cash drawer. The defendant challenges the sufficiency of the evidence identifying him as the perpetrator.

Discussion

1. Sufficiency of the evidence

In considering a challenge to the sufficiency of the evidence, we "review the evidence in the light most favorable to the Commonwealth to determine whether 'any rational trier of fact could have found the essential elements of the crime beyond a reasonable doubt.' "

Commonwealth v. Powell, 459 Mass. 572, 579 (2011), cert. denied, 132 S.Ct. 1739 (2012), quoting *Commonwealth v. Latimore*, 378 Mass. 671, 677 (1979). "The inferences drawn by the jury need only be reasonable and possible and need not be necessary or inescapable...." *Commonwealth v. Lao*, 443 Mass. 770, 779 (2005), S. C., 450 Mass. 215 (2007), and 400 Mass. 12 (2011), quoting *Commonwealth v. Longo*, 402 Mass. 482, 487 (1988). "Whether an inference is warranted or is impermissibly remote must be determined, not by hard and fast rules of law, but by experience and common sense." *Commonwealth v. Lao, supra*, quoting *Commonwealth v. Giang*, 402 Mass. 604, 609 (1988).

a. Identification based on expert fingerprint testimony.

The Commonwealth introduced expert testimony from Foley, who at the time of trial had had forty years' experience in latent fingerprint analysis. Foley had compared latent No. 4 to the rolled fingerprint of the defendant's right thumb using the ACE-V methodology, so named because it involves a four-step process of analysis, comparison, evaluation, and verification. The defendant does not challenge the admissibility of Foley's testimony, but argues rather that the jury lacked sufficient evidence to evaluate it and therefore to identify the defendant as the perpetrator on the basis of the fingerprint. Although the defendant raises this issue for the first time on appeal, we consider the claim because "findings based on legally insufficient evidence are inherently serious enough to create a substantial risk of a miscarriage of justice." *Commonwealth v. Powell*, 459 Mass. at 579, quoting *Commonwealth v. Grandison*, 433 Mass. 135, 140 n. 8 (2001).

By way of background, and as noted in *Commonwealth v. Gambora*, 457 Mass. 715, 726-

727 (2010) (*Gambora*), "courts historically have found fingerprint evidence to be admissible." See *Commonwealth v. Patterson*, 445 Mass. 626, 644 (2005) (*Patterson*) (discussing general acceptance by relevant technical community of latent fingerprint identification theory and ACE-V methodology); *Commonwealth v. Bartolini*, 299 Mass. 503, 513, cert. denied, 304 U.S. 565 (1938). In 2009, however, the National Research Council for the National Academy of Sciences (NAS) published a report questioning the scientific validity of latent print identification theory and the ACE-V methodology. See National Research Council, *Strengthening Forensic Science in the United States, A Path Forward* 142-144 (2009) (NAS Report).

The primary concern of the NAS Report, as noted in *Gambora*, 457 Mass. at 726, appears to have been "the need to prevent overstatement of the accuracy of fingerprint comparisons, and for additional research." [FN6] See *id.* at 736 (Spina, J., concurring) ("While the 'science' of fingerprint analysis may be valid, claims by its practitioners that the process can establish identity with absolute certainty are not"). We considered in *Gambora*, *supra* at 722, 724, the implications of the NAS Report in the context of a challenge to the admission of expert testimony that "individualized" two latent fingerprints to the defendant.

"Individualization" means "a conclusion by the examiner that the particular evidence comes from 'a single unambiguous source.'" *Id.* at 720 n. 5, quoting NAS Report at 136. We cautioned that "testimony to the effect that a latent print matches, or is 'individualized' to, a known print, if it is to be offered, should be presented as an opinion, not a fact, and opinions expressing absolute certainty about, or the infallibility of, an 'individualization' of a print should be avoided." *Id.* at 729 n. 22. Although further research and developments in the field of forensic fingerprint analysis may provide greater transparency and lead to a reduction in error rates, expert fingerprint testimony based on the ACE-V methodology continues to be admissible provided that the testimony is limited to expression of opinion. See *id.* at 727, quoting NAS Report at 142 (it is "'plausible' ... that 'a careful comparison of two impressions can accurately discern whether or not they had a common source'"); *Patterson*, 445 Mass. at 628 ("the underlying theory and process of latent fingerprint identification, and the ACE-V method in particular, are sufficiently reliable to admit expert opinion testimony regarding the matching of a latent impression with a full fingerprint").

[FN7]

With this framework in mind, we turn to the defendant's challenge to the sufficiency of the expert testimony as a basis for identifying him. Foley testified that a fingerprint contains both a general pattern, such as whorls, loops, or arches, and minutia points, which are details formed where the ridges begin, end, join, or bifurcate. Foley noted that "as far as everyone is concerned among the discipline of fingerprints, no two people have ever been found to have the exact fingerprints. Twins will have the same pattern sometimes. But they will not have the same minutia points." In explaining the ACE-V methodology, Foley testified that a fingerprint examiner first analyzes a latent print to ensure that it displays a sufficient number of minutia

points for comparison purposes. The examiner then compares the latent print to a known print. In the evaluation stage, the examiner "makes a decision: 'No, it's not this person. Yes, it is this person.' " Finally, another examiner verifies the first examiner's work. [FN8]

The Commonwealth introduced enlarged photographs of latent No. 4 and the defendant's rolled thumb print, each depicting twenty-one minutia points identified by Foley and marked as common between the two prints. These exhibits were before the jury during Foley's testimony, in which he explained that he had placed a dot on each location where he found a minutia point and had numbered these dots to indicate the points of comparison between the two prints. He described each of the matching minutia points, and testified that there were "many others" that he had not marked because the photographs would have become too difficult to read. Since the top area of latent No. 4 was smeared, Foley did not number and identify as matches any of the minutia points from that area. Foley acknowledged the possibility that the smear on latent No. 4 could hide a point of dissimilarity. He did not agree, however, that the smear contained no point of comparison to the defendant's fingerprint. Using the enlarged photographs of the two prints, Foley pointed to an area in the smear that he said contained "an enclosure that is very, very pronounced," and could match part of the defendant's rolled print in the corresponding area. Foley testified further that, if he had found a dissimilarity between the two fingerprints not attributable to a smear, then he "wouldn't call it an identification." As to the three other latent fingerprints recovered from the cash drawer, Foley testified that he had made no identification and could not ascertain their source.

The prosecutor did not ask Foley to testify explicitly to his opinion regarding whether latent No. 4 matched the defendant's rolled thumb print, [FN9] but the jury could have inferred from Foley's testimony that it was his opinion that the two fingerprints matched. As required under *Gambora*, 457 Mass. at 729 n. 22, Foley did not express certainty about the match. [FN10]

The defendant argues that Foley's testimony was insufficient to enable the jury to identify the defendant as the perpetrator because Foley "provided no standard by which he measured the comparison or the probability that the fingerprints came from the same source." In support of this contention, the defendant relies on cases holding that the Commonwealth may not introduce evidence of a deoxyribonucleic acid (DNA) match or nonexclusion without accompanying evidence concerning the likelihood of a such a result in the general population. See *Commonwealth v. Mattei*, 455 Mass. 840, 852 (2010); *Commonwealth v. Curnin*, 409 Mass. 218, 222 n. 7 (1991).

The DNA cases relied on by the defendant are inapposite. Whereas those cases address the *admissibility* of expert DNA testimony in the absence of accompanying statistical evidence, see *Commonwealth v. Mattei*, *supra* at 855; *Commonwealth v. Curnin*, *supra*, the issue in this case is the *sufficiency* of fingerprint evidence whose admissibility is not disputed. Although we have

recognized the "necessarily probabilistic" nature of fingerprint identification evidence, we have not required the Commonwealth to provide accompanying statistical information like that sought by the defendant. See *Commonwealth v. Beausoleil*, 397 Mass. 206, 217 n. 15 (1986); *Commonwealth v. Drayton*, 386 Mass. 39, 50 (1982). Indeed, in *Gambora*, 457 Mass. at 723, 727, we noted the absence of such statistical evidence, yet affirmed the continuing admissibility of fingerprint identification testimony based on the ACE-V methodology. [FN11]

The weight and credibility to be accorded the identification evidence provided by Foley's testimony was for the jury to determine. See, e.g., *Patterson*, 445 Mass. at 648 ("the jury will decide the ultimate question of the conclusiveness of the results of a reliable application of a methodology"); *Commonwealth v. LaCorte*, 373 Mass. 700, 702 (1977) ("it is for the jury to determine--after listening to cross-examination and the closing arguments of counsel--what significance, if any, they will attach to the discovery of the defendant's fingerprints at the scene of the crime"). As with other expert testimony, where an expert testifies to an opinion that a latent print found at the crime scene matches the defendant's known print, the jury may choose whether to credit this opinion. See *Commonwealth v. Roberio*, 428 Mass. 278, 281 (1998). Indeed, even critics of fingerprint evidence consider such evidence more probative than other identification evidence, such as a victim's identification of a stranger as the perpetrator, see Mnookin, *The Courts, the NAS, and the Future of Forensic Science*, 75 *Brook. L.Rev.* 1209, 1239 (2010), and our courts have held that such stranger identifications alone may suffice to prove the identity of the perpetrator. *Commonwealth v. Andrews*, 427 Mass. 434, 441-442 (1998), citing *Commonwealth v. Marsh*, 26 Mass.App.Ct. 933, 934 (1988). See *Commonwealth v. Clements*, 436 Mass. 190, 194 (2002). Thus, the jury could credit Foley's expert opinion that latent No. 4 matched the defendant's rolled thumb print.

The defendant maintains that the presence of a smear on the top portion of latent No. 4 precluded the jury from finding that the fingerprints matched. "Latent print impressions left at crime scenes are often partial impressions of a full fingerprint"; "the uniqueness of two full fingerprints does not, in and of itself, prove that one small portion of a fingerprint cannot mirror one portion of another fingerprint." *Patterson*, 445 Mass. at 629. However, just as the jury could infer that Foley considered the two prints a match, they also could infer that, based on his forty years' experience in fingerprint analysis, Foley considered the likelihood of two nonmatching prints sharing twenty-one minutia points and "many others" to be small. [FN12] The Commonwealth was not required to precisely quantify this small possibility. See *Commonwealth v. Beausoleil*, 397 Mass. at 217 n. 15 (identification in criminal case may hinge entirely on fingerprint testimony that is "necessarily probabilistic in nature, whether or not the expert's opinion is actually phrased in terms of a stated probability"); *Commonwealth v. Drayton*, 386 Mass. at 50-51 ("the expert's opinion that the odds were 387 trillion to one that the fingerprints were made by the same person added nothing to his previous, positive opinion that they were made by the same person").

Based on Foley's testimony, the jury could have found that the fingerprint lifted from the crime scene was left there by the defendant, and the additional evidence that the defendant had the same height and skin tone as the perpetrator further supported this inference. The jury also could have concluded, based on the testimony of Saab, the store owner, and Alexander, the cashier, that the defendant could not have touched the cash drawer other than during the robbery. Therefore, the evidence was sufficient for the jury to have concluded, beyond a reasonable doubt, that the defendant was the perpetrator. See, e.g., *Commonwealth v. Netto*, 438 Mass. 686, 701-702 (2003); *Commonwealth v. Clark*, 378 Mass. 392, 404-406 (1979); *Commonwealth v. LaCorte*, 373 Mass. at 703.

b. Force

The defendant also challenges the sufficiency of the Commonwealth's evidence as to the "force" element of armed robbery. [FN13] This element "may be encompassed in either of two ways: by force applied to the person ... or by an assault putting the person in fear." *Commonwealth v. Richards*, 363 Mass. 299, 302 (1973). Here, the Commonwealth proceeded on the latter theory. The defendant points to Alexander's testimony that he was not afraid during the incident, and on this basis, argues that the Commonwealth cannot establish that Alexander was put in fear.

To support a conviction for armed robbery based on fear, the Commonwealth must establish actual fear or apprehension on the part of the victim. See *id.* at 304; *Commonwealth v. Novicki*, 324 Mass. 461, 465-467 (1949) (finding no robbery where there was no evidence that fright of victim when she observed robber, of whom she had been unaware, leaving bank cage with money was factor in taking that money from her constructive possession). "Whether actual or constructive force [i.e., fear] is employed, the degree of force is immaterial so long as it is sufficient to obtain the victim's property 'against his will.'" *Commonwealth v. Jones*, 362 Mass. 83, 87 (1972), quoting G.L. c. 277, § 39. In general, the Commonwealth can establish fear by showing "objectively menacing conduct by the defendant, ... undertaken with the intent to put the victim in fear" (citation omitted). *Commonwealth v. Souza*, 428 Mass. 478, 491 n. 25 (1998), quoting *Commonwealth v. Marcotte*, 18 Mass.App.Ct. 391, 394 (1984). See *Commonwealth v. Marcotte*, *supra* at 395 n. 2 ("In the ... usual situation, where there is evidence that the defendant intended to steal property from the victim, that he engaged in some objectively menacing conduct toward the victim, and that such conduct facilitated a theft from the victim, the inferences that the defendant intended to put the victim in fear and that, in fact, the victim was put in fear are virtually inescapable"). Both carrying a weapon, even one of which the victim is unaware, and carrying a mask, even one that is not worn, increase the level of fear and apprehension a victim may feel. See *Commonwealth v. Knight*, 16 Mass.App.Ct. 622, 626-627 (1983) ("We think analogous considerations [to those involving a weapon] are involved where a mask or a disguise is used. Armed robbery while masked or disguised is an aggravated form of robbery, not only because of increased fear on the part of the victim, but because the 'effect of

these masks ... prevents identification and detection' " citation omitted).

Applying this standard, we conclude that the Commonwealth presented sufficient evidence of fear. Alexander testified that the masked intruder demanded "all the fucking money," while brandishing a gun. The jury could infer from this objectively menacing conduct that the defendant had in fact instilled fear in Alexander, who responded by immediately handing over the cash drawer. See *Commonwealth v. Souza, supra*; *Commonwealth v. Richards*, 363 Mass. at 301, 304-305; *Commonwealth v. McCarthy*, 360 Mass. 566, 568 (1971). Alexander's testimony that he "wasn't looking at the intruder's eyes too much" and Delvalle's testimony regarding Alexander's nervous demeanor and fast speech provided additional evidence of fear. Although Alexander maintained that he was not afraid, the jury could have rejected this portion of his testimony as "false bravado." See *Commonwealth v. Davis*, 70 Mass.App.Ct. 314, 316 n. 3 (2007).

2. Closing argument

The defendant argues that the prosecutor misstated the evidence in her closing argument, thereby requiring a new trial. Because the defendant did not object to the statements at trial, we review to determine whether any error created a substantial risk of a miscarriage of justice.

Commonwealth v. Grandison, 433 Mass. 135, 141-142 (2001). In closing argument, a prosecutor may not "misstate the evidence or refer to facts not in evidence." *Commonwealth v. Lewis*, 465 Mass. 119, 129 (2013), quoting *Commonwealth v. Kozec*, 399 Mass. 514, 516 (1987). However, a prosecutor may argue reasonable inferences from the evidence. *Commonwealth v. Lewis, supra*, quoting *Commonwealth v. Kozec, supra*.

The defendant maintains that the prosecutor misstated the evidence when she argued that, according to Delvalle's testimony, he saw the perpetrator in the surveillance video touch "the back of the drawer," the location where investigators discovered latent No. 4. Although Delvalle did not refer specifically to "the back of the drawer," he testified that "from the video surveillance, we kind of had an idea of where the suspect touched the drawer and police were able to recover the prints from those areas." When combined with other evidence that police recovered latent No. 4 from the back of the drawer, this testimony supports the reasonable inference that Delvalle saw the perpetrator touch this area. [FN14] See *Commonwealth v. Wallace*, 460 Mass. 118, 125-126 (2011); *Commonwealth v. Kirwan*, 448 Mass. 304, 317 (2007). Indeed, the prosecutor made the contested statements in order to link the perpetrator to latent No. 4, and Delvalle's testimony provided this link directly. There was no error.

3. Probation revocation

The defendant argues that the judge at his probation revocation hearing, who also presided at his criminal trial, violated his due process rights by prohibiting him from presenting additional

evidence as to whether he committed the robbery. A probation revocation hearing involves a two-stage process, in which a judge first determines whether a probationer violated a condition of probation and then, if so, decides whether the violation warrants revocation. See *Commonwealth v. Faulkner*, 418 Mass. 352, 365 n. 11 (1994); *Commonwealth v. Durling*, 407 Mass. 108, 111-112 (1990), and cases cited. At both stages, the defendant sought to introduce evidence, not introduced at trial, that he did not commit the robbery. The judge denied these requests, on the ground that the jury verdict had resolved any question whether he committed the robbery.

Although a probationer is not entitled to the full panoply of constitutional protections afforded in a criminal trial, due process requires certain minimum rights at a probation revocation hearing, including the right to present evidence in defense. See *Gagnon v. Scarpelli*, 411 U.S. 778, 782, 786 (1973), citing *Morrissey v. Brewer*, 408 U.S. 471 (1972); *Commonwealth v. Kelsey*, 464 Mass. 315, 319-320 (2013); *Commonwealth v. Durling*, 407 Mass. at 112-113. Even when the alleged probation violation consists of a new crime, a judge need find only by a preponderance of the evidence that a violation has occurred. See *Commonwealth v. Kelsey*, *supra* at 324-325. Because it rests on a finding of guilt beyond a reasonable doubt, however, "a criminal conviction ... adequately protects the probationer's right to due process, and may serve as the basis for a summary finding of a probation violation even though the judge lacks the factual information to make an independent determination that a probation violation has occurred." *Commonwealth v. Maggio*, 414 Mass. 193, 198 (1993), citing *Rubera v. Commonwealth*, 371 Mass. 181-182 (1976). See *Carchman v. Nash*, 473 U.S. 716, 731-732 (1985); *Commonwealth v. Holmgren*, 421 Mass. 224, 227-228 (1995).

Accordingly, at the first stage of the hearing, the judge properly could have relied on the defendant's conviction of armed robbery, and need not have permitted introduction of the proposed evidence revisiting the jury's verdict. See *Commonwealth v. Odoardi*, 397 Mass. 28, 34 (1986) (after conviction, judge could limit cross-examination during probation revocation hearing because "we do not interpret *Gagnon v. Scarpelli*, 411 U.S. 778, to mean that a judge is without discretion to limit or curtail irrelevant or redundant inquiries"). That the defendant did not introduce the evidence before the jury does not render its exclusion from the probation revocation hearing a violation of due process. See *Stefanik v. State Bd. of Parole*, 372 Mass. 726, 735 (1977) ("One may agree that two different hearings might present different strategic choices and opportunities, without agreeing that this full range of litigation strategies is a constitutional requirement").

As to the second stage of the hearing, once the judge determines that a probation violation has occurred, a probationer still has the right "to present ... mitigating circumstances and to put the probation violation in the 'best possible light.'" *Commonwealth v. Pena*, 462 Mass. 183, 188 (2012), quoting *United States v. Morin*, 889 F.2d 328, 332 (1st Cir.1989). The excluded

evidence here, however, went to the first stage of the hearing, and the judge acted properly in declining to consider it at the second stage. See *Commonwealth v. Milot*, 462 Mass. 197, 202 (2012).

Judgments affirmed.

Footnotes

FN1. The judge denied the defendant's motion for a required finding or, in the alternative, to set aside the verdict.

FN2. We reserve certain facts for discussion of the issues raised.

FN3. The surveillance videotape, which was recorded in color, was not secured and no copy of it was made; it was destroyed prior to trial.

FN4. "Latent fingerprints are fingerprint impressions that are not visible to the naked eye without chemical enhancement." *Commonwealth v. Gambora*, 457 Mass. 715, 720 n. 6 (2010) (*Gambora*), quoting *Commonwealth v. Patterson*, 445 Mass. 626, 629 (2005) (*Patterson*).

FN5. On the night of the robbery, Alexander described the perpetrator as a "white male." Based on the surveillance footage, Delvalle also described the perpetrator as a "white male" in his police report. These descriptions were important to the defense because, as defense counsel argued in his opening statement, the defendant is African-American. Both Alexander and Delvalle testified, however, that they believed that the perpetrator was "white" based on the light skin tone of his hands. As the judge noted in denying the defendant's motion for a required finding, the jury could conclude from their own observations that witnesses seeing only the defendant's hands might have assumed that he was Caucasian.

FN6. "The National Research Council for the National Academy of Sciences (NAS) report does not appear to question the underlying theory which grounds fingerprint identification evidence: as the report states, there is scientific evidence supporting the theory that fingerprints are unique to each person and do not change over a person's life." *Gambora*, 457 Mass. at 724, citing National Research Council, *Strengthening Forensic Science in the United States, A Path Forward* 143-144 & n.34 (2009) (NAS Report). However, that human friction ridge arrangements are unique provides no "guarantee that prints from two different people are always sufficiently different that they cannot be confused, or that two impressions made by the same finger will also be sufficiently similar to be discerned as coming from the same source." *Gambora, supra* at 724-725, quoting NAS Report at 144. This is in large part due to the subjective nature of the judgments that a fingerprint examiner makes in conducting each step of the ACE-V methodology, as well as the possible effects of unintended examiner bias. See *Gambora, supra* at 725-726. The NAS Report suggests the need for research in a number of areas, and the "development of statistical models to give 'match' probabilities based on

population distributions of particular ridge characteristics." *Id.* at 725 n. 11, citing NAS Report at 142.

FN7. Since the publication of the NAS Report, preliminary statistical evidence has begun to emerge concerning the false positive error rate of fingerprint analysis (the rate at which a fingerprint examiner mistakenly identifies a fingerprint as a match to a latent print given that the print was of value for individualization and was not the source of the latent print). See, e.g., Ulery, Hicklin, Buscaglia, & Roberts, Accuracy and Reliability of Forensic Latent Fingerprint Decisions, 108 Proceedings of the National Academy of Sciences of the United States of America 7733, 7735 (2011) (finding false positive error rate of 0.1 per cent, with no two examiners making same false positive error); G.M. Langenburg, A Critical Analysis and Study of the ACE-V Process 145-146 (2012) (discussing study finding false positive error rate of 1.1 per cent with no verification step, and below 1 per cent with verification step); *id.* at 215 (discussing study finding false positive error rate of 2.6 per cent with no verification step). An increasing amount of data have also become available regarding the population frequencies of various fingerprint features. See, e.g., Expert Working Group on Human Factors in Latent Print Analysis, Latent Print Examination and Human Factors: Improving the Practice Through a Systems Approach 55-62 (2012), and authorities cited.

FN8. Additional information regarding the ACE-V methodology is set forth in *Patterson*, 445 Mass. at 630-632.

FN9. The parties and the judge appeared to agree that Foley should not be asked to testify as to his opinion. As mentioned, *Gambora* permits a fingerprint expert to opine on whether two fingerprints match, and it would have been helpful had he been asked to do so here. Cf. *Commonwealth v. Pytou Heang*, 458 Mass. 827, 844 (2011) ("The purpose of expert testimony is to assist the trier of fact in understanding evidence or determining facts in areas where scientific, technical, or other specialized knowledge would be helpful").

FN10. The defendant does not dispute that the jury reasonably could infer that Foley considered the two prints to match. He suggests, however, that the testimony exceeded the bounds set forth by *Gambora*, 457 Mass. at 729 n. 22, by communicating that the two prints matched as a matter of fact rather than opinion. We do not agree. Foley's testimony did not "express absolute certainty about, or the infallibility of, the implied 'individualization.'" See *id.*

FN11. As discussed, the limitations on fingerprint analysis are addressed currently by the prohibition on an expert's testifying to a match as a matter of fact or absolute certainty. See *Gambora*, 457 Mass. at 729 n. 22. As research on error rates and fingerprint population frequencies reach a point that permits more reliable conclusions, this approach may be revised accordingly. Cf. *Doe, Sex Offender Registry Bd. No. 151564 v. Sex Offender Registry Bd.*, 456 Mass. 612, 623 n. 6 (2010) ("Where, as here, scientific knowledge in a field is rapidly evolving ..., the applicable standards may require more frequent modification in order to reflect accurately

the current state of knowledge" citation omitted). Because the primary question about the accuracy and reliability of fingerprint identification involves not the uniqueness of different fingerprints but an examiner's ability reliably to discern such differences, see NAS Report at 144, the false positive error rate may provide a more useful statistic than one measuring the population frequency of a certain set of print features. See Koehler, *Fingerprint Error Rates and Proficiency Tests: What They Are and Why They Matter*, 59 *Hastings L.J.* 1077, 1079 (2008) ("if experts make false positive errors, say, one time in 200, then it does not matter whether the chance that two randomly selected prints match is one in a million, billion, or trillion ... because in these situations, the false positive error rate limits and controls the probative value of the match report").

FN12. To the extent that it exists, accompanying statistical information like that sought by the defendant apparently would have supported the conclusion that, even with a small number of minutia points, the likelihood of two nonmatching prints sharing them is quite small. Research indicates that fingerprint examiners often determine a match exists if the fingerprints share more than eight or nine minutia points, see G.M. Langenburg, *A Critical Analysis and Study of the ACE-V Process* 205 (2012), and *Patterson*, 445 Mass. at 633, and preliminary studies suggest that such identifications prove false only a small percentage of the time. See note 7, *supra*. One study estimates that the likelihood of two random partial fingerprints from the general population sharing sixteen minutia points ranges from about one in 1.8 million to one in 1.3 billion, depending upon the total number of minutia points considered in each partial fingerprint. See Fang, Srihari, & Srinivasan, *Generative Models for Fingerprint Individuality Using Ridge Types*, *Proceedings of the Third International Symposium on Information Assurance and Security* 423, 428 (2007). Although latent No. 4 and the defendant's rolled thumb print may have displayed more total minutia points than the partial fingerprints at issue in that study, according to Foley's testimony, they also shared more than sixteen minutia points; he testified that he had identified twenty-one shared points, and that there were others he had not indicated on the photographs he described to the jury.

FN13. Armed robbery is defined as (1) larceny from a person (2) committed while armed with a dangerous weapon and (3) facilitated by actual or constructive force against the person. G.L. c. 265, § 17; *Commonwealth v. Anderson*, 461 Mass. 616, 633, cert. denied, 133 S.Ct. 433 (2012); *Commonwealth v. Grice*, 410 Mass. 586, 589 (1991).

FN14. In response to the prosecutor's question, "Where did it appear that the suspect touched the drawer," Delvalle responded, "It seemed like in the front of the door handle." The defendant argues on this basis that Delvalle's testimony is that the perpetrator touched the front, not the back, of the drawer. However, Delvalle's reference to the "*door handle*" and his response to the next question, in which he described the perpetrator "looking through the door, seeing if anyone is coming," support the inference that Delvalle misheard the prosecutor's question about "the drawer" as asking about "the door." In any event, the jury could have inferred that Delvalle saw the perpetrator touch the back of the drawer from Delvalle's testimony that police obtained the

fingerprints from the location where he saw the perpetrator touch the drawer, combined with the evidence that police took latent No. 4 from the back of the drawer.

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