

### **QUESTION PRESENTED**

Whether the Commonwealth met its burden under *Commonwealth v. Lanigan*, 419 Mass. 15 (1994) to establish the reliability of latent fingerprint individualization applying ACE-V methodology to simultaneous impressions.

### **STATEMENT OF THE CASE**

On October 27, 1993, a Suffolk County grand jury indicted both Terry L. Patterson ("Patterson") and Sean Ellis ("Ellis") for murder, armed robbery, and two counts of possession of a dangerous weapon. On February 1, 1995, Patterson was convicted on all charges.<sup>1</sup> A timely notice of appeal was filed.

On March 20, 1996, and December 31, 1998, appellate counsel filed motions seeking a new trial. Timely appeal was taken from the denial of both motions. All three appeals were consolidated and on December 6, 2000, the Supreme Judicial Court reversed the conviction. *Commonwealth v. Patterson*, 432 Mass. 767 (2000).

On October 10, 2002, defendant filed in the Superior Court a Motion In Limine To Exclude

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<sup>1</sup> Ellis was tried separately, and eventually convicted after two mistrials. His conviction was affirmed. *Commonwealth v. Ellis*, 432 Mass. 746 (2000).

Fingerprint Evidence, along with a Memorandum of Law in Support of Motion in Limine to Exclude Fingerprint Evidence and two Appendices containing 47 exhibits comprising over 500 pages. The Motion, relying on *Commonwealth v. Lanigan*, 419 Mass. 15, 26 (1994) and *Daubert v. Merrell Dow Pharmaceuticals*, 509 U.S. 579 (1993), asserted that latent fingerprint evidence is unreliable. On December 10, 2003, the Commonwealth filed its opposition. A *Lanigan/Daubert* hearing was held on the Motion, excluding specific challenges to the particular identification testimony herein, from May 17, 2004 to May 21, 2004.<sup>2</sup> On October 12, 2004, the trial court (Hinkle, J.) issued findings denying

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<sup>2</sup> Each party called one live expert witness, who each also provided an affidavit stating his opinions. The defendant called Professor James E. Starrs, a tenured full professor of forensic sciences in the Columbia College of Arts and Sciences at the George Washington University, and also a professor of law at the George Washington Law School. Starrs, M.Tr. 1/11-12. See Ex. 48, Vita, James E. Starrs, and Ex. 49, Affidavit of Professor James Starrs. The Commonwealth called Special Agent Stephen B. Meagher, a Supervisory Fingerprint Specialist and Unit Chief of the FBI Latent Print Unit III. Meagher, M.Tr. 2/126. See Ex. 54, Curriculum Vitae, Stephen B. Meagher and Ex. 55, Affidavit of Stephen B. Meagher.

Pursuant to motion, the defendant provided testimony via transcript from *United States v. Byron Mitchell*, Cr. No. 96-407 (E.D. Pa. 1999) (Joyner, J.), from Dr. Simon Cole and Dr. David Stoney, and the Commonwealth provided *Mitchell* transcript testimony from Sgt. David Ashbaugh and Dr. William Babler.

defendant's Motion. In response to defendant's request for clarification, supplemental findings were issued on November 23, 2004.

On November 28, 2004, defendant filed a Motion for Appellate Resolution of the *Lanigan/Daubert* Fingerprint Issue Herein. The Commonwealth agreed that pre-trial appellate resolution was appropriate. The trial court filed a reservation and report to the Appeals Court on January 14, 2005. The Notice of Assembly of Record issued on February 3, 2005. The Appeals Court entered the case on February 8, 2005, number 2005-P-0167. Defendant has filed a petition for Direct Appellate Review, with the support of the Commonwealth, which is currently pending before the S.J.C., DAR No. 14675.

#### **STATEMENT OF FACTS**

##### **A. THE FACTS OF THIS CASE**

In the first trial, the only physical evidence linking Patterson to the scene of Detective John Mulligan's death came from Boston Police Officer Robert Foilb ("Foilb") of the Identification Unit, who opined, based on his theory of "simultaneous" fingerprints (he added up points from three different latent impressions) that four latent impressions on the driver's door window of Mulligan's auto belonged to

Patterson. Ex. 47, pp. *passim*, particularly 84.<sup>3</sup>

Foilib opined that the latent impressions respectively had six, five, two, and zero points of similarity with Patterson's fingers. Ex. 47, pp. 85, 94. He did not find eight points of comparison on any one finger, the number he baldly claimed was the generally accepted minimum in Massachusetts,<sup>4</sup> between any of the latent impressions on the car and the inked impression of any one of Patterson's fingers. Ex. 47, pp. 93-94.

Since the Boston Police Fingerprint Unit has been

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<sup>3</sup> The transcript of the Motion Hearing is cited as "M.Tr. volume/page." Exhibits from the hearing are contained in the Record Appendix as numbered entries, first the admitted exhibits by entry number, then the exhibits marked for identification. Other Record papers and pleadings are included in the Record Appendix as lettered entries. Citations to the record are of the form "R. entry number/letter". Citations to page or paragraph numbers for any entry are to the numbers from the document itself.

<sup>4</sup> Although the defendant challenges the validity of any fingerprint evidence, where such evidence has been admitted, the number of points of identity minimally required to support an admissible opinion identifying a fingerprint is usually twelve, see *Commonwealth v. Drayton*, 386 Mass. 39, 49 (1982) (fingerprint examiner relied on twelve points of comparison); Ex. 5, "FBI, *Fingerprint Identification*," pp. 1-2. "There is no generally accepted number of points of identity required for an identification, although most examiners require twelve points." MASSACHUSETTS CRIMINAL DEFENSE, Vol. 1, Eric Blumenson, Ed., § 12.6A, p. 12 (1990). Herein, the Commonwealth contended in the Superior Court that no minimum number of points of identity should be required.

suspended from performing latent fingerprint analysis, on retrial the Commonwealth intends to offer the same fingerprint identification opinion by State Trooper Kenneth Martin. R.\*\*\* Notably, the Commonwealth provided, on March 15, 2005, subsequent to the hearing herein, a report from the F.B.I. dated February 17, 2005, stating that the latent prints in this case are of no value and cannot be matched to the defendant. Add., p. \*\*\*.? While reserving the right to challenge Martin's opinion, defendant challenges the reliability of latent fingerprint analysis as inadequate to meet the standards for admissibility established by *Commonwealth v. Lanigan*, 419 Mass. 15, 26 (1994) and *Daubert v. Merrell Dow Pharmaceuticals*, 509 U.S. 579 (1993).

**B. A BRIEF DESCRIPTION OF FINGERPRINT ANALYSIS**

Examiners compare latent fingerprints with fingerprints rolled from a suspect's fingers.<sup>5</sup> An examiner makes an identification based upon the examiner's opinion that are there a sufficient number of ridge characteristics in common between the latent

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<sup>5</sup> See Technical Definitions, Add., pp. \*\*\* and Facts Adduced at the *Lanigan/Daubert* Hearing, Add. pp. \*\*\*.

and rolled print under comparison, both as to type and location of the characteristic. Ex. 5, FBI, *Fingerprint Identification*, p. 1.

All prints, both inked and latent, are subject to distortions and artifacts. Ex. 6, p. 513. Other distortions can be caused by the shape of the surface on which the print has been deposited and by the method used to develop and lift the print. Ex. 7, 94-95. Distortion can cause a ridge characteristic to appear as something other than what it may really be. *Id.* at 82; Ex. 12, p. 1193. For example, powder used to develop a latent print may cause a ridge ending to appear to be a bifurcation. Ex. 7, pp. 120-121. There have been no studies to determine the frequency of such distortions.

It is well documented that different people can share a number of ridge characteristics. Exhibit 13, for example, is an article that discusses fingerprints from two different people which contain seven matching characteristics. Exhibit 14 is a textbook reference to fingerprints from different individuals that have ten characteristics in common. There have been no scientific studies that can reasonably predict the probability of such events occurring. In *United States*

*v. Parks*, No. CR-91-358-JSL (C.D. Cal. Dec. 11, 1991), Steven Kasarsky, a board certified member of the International Association for Identification (IAI), the primary professional association for fingerprint examiners, formerly employed and trained by the FBI, testified that instances of ten points of similarity from prints of two different people occur and he personally had observed six points of similarity from different persons. Ex. 8 (Transcript, *United States v. Parks*, No. Cr. 91-358-JSL at 568-569, 575, 599-600, 602 (C.D. Cal. 1991)).

Lacking verified data, latent print examiners do not offer opinions in terms of probability. Indeed, IAI rules prohibit examiners from doing so. Ex. 15. Instead, examiners claim "absolute certainty" for any identification, *i.e.*, the latent print at issue was made by a particular finger to the exclusion of all other fingers in the world.

Latent fingerprint identification evidence was first accepted in the early 1900's subject to "meager judicial scrutiny" of the newly claimed expertise. Ex. 18, p. 1100. The courts that initially permitted latent fingerprint opinions did not provide anywhere near the rigor required of expert evidence by the

S.J.C. in *Commonwealth v. Lanigan*, 419 Mass. 15, 26 (1994) or by the United States Supreme Court in *Daubert v. Merrell Dow Pharmaceuticals*, 509 U.S. 579 (1993). Ex. 19 (Margaret A. Berger, *Procedural Paradigms For Applying the Daubert Test*, 78 Minn. L. Rev. 1345, 1353 (1994)) ("Considerable forensic evidence [such as fingerprinting] made its way into the courtroom without empirical validation of the underlying theory and/or its particular application."). However, as leading forensic science experts now recognize, opinions based on latent fingerprint examinations are vulnerable to a *Lanigan/Daubert* analysis:

When and if a court agrees to revisit the admissibility of fingerprint identification evidence under *Daubert*, the *Daubert* approach - that courts may admit scientific evidence only if it meets contemporary standards of what is real science - is likely to meet its most demanding test: a vote to admit fingerprints is a rejection of conventional science as the criterion for admission; a vote for science is a vote to exclude fingerprint expert opinions.

Ex. 18, pp. 1105-1106. Latent fingerprint evidence fails each of the criteria for admission identified in *Daubert* as well as the factors recognized in *Lanigan*.

#### **SUMMARY OF THE ARGUMENT**

Five factors, originally proposed by the United States Supreme Court in *Daubert*, adopted and endorsed

by the S.J.C. in *Lanigan* and employed by the trial court herein, are employed in determining whether proffered expert testimony is demonstrably reliable.<sup>6</sup> The Commonwealth failed to meet its burden as to each factor:

1. Most critical is the question whether the "theory or technique . . . can be (and has been) tested."<sup>7</sup>

*Daubert*, 509 U.S. at 593 (emphasis added). Empirical testing is the essential criterion of science:

Scientific methodology today is based on generating hypotheses and testing them to see if they can be falsified; indeed, this methodology is what distinguishes science from other fields of human inquiry. The statements constituting a scientific explanation must be capable of empirical test. The criterion of the scientific status of a theory is its falsifiability, or testability.

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<sup>6</sup> Since the inquiry is a "flexible one," the Court emphasized that additional factors may be considered. *Daubert*, 509 U.S. at 594. The Court subsequently made clear in *Kumho Tire*, 526 U.S. at 149-158, that these same five factors may also be applied in assessing the reliability of an expert testifying on the basis of "specialized" or "technical" knowledge. *Canavan's Case*, 432 Mass. at 313.

<sup>7</sup> "Demonstrated reliability" requires these premises to have been actually tested. Simply being able to phrase the premises of an opinion in a testable way does not suffice. Contrast *U.S. v. Mitchell*, 365 F.3d 215, 238 (3<sup>rd</sup> Cir. 2004). If framing a hypothesis in a testable way were the criterion, astrology, among other unacceptable expertise, would satisfy the "testability" criterion.

*Id.* (internal quotations and citations omitted); see also *Lanigan*, 419 Mass. at 25-26. There has been no testing to determine what constitutes a sufficient latent print to justify an identification. *Infra*, pp. 20-34.

2. The "known or potential rate of error" of a particular technique should also be considered. *Daubert*, 509 U.S. at 594; see also *Commonwealth v. Rosier*, 425 Mass. 807, 813-815 (1997); *Lanigan*, 419 Mass. at 27. The trial court correctly rejected the Commonwealth's claim of a zero error rate, but abused its discretion in finding there is any known rate of error regarding how much comparative information is needed to match a latent print to a rolled print. *Infra*, pp. 34-45.

3. The "existence and maintenance of standards controlling the technique's operation."<sup>8</sup> *Daubert*, 509 U.S. at 594; see also *Rosier*, 425 Mass. at 812-815; *Lanigan*, 419 Mass. at 26-27. There are no standards

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<sup>8</sup> As an example of such standards, the Supreme Court cited the Second Circuit's opinion in *United States v. Williams*, 583 F.2d 1194, 1198 (2<sup>nd</sup> Cir. 1978), in which the Second Circuit observed that the "International Association of Voice Identification . . . requires that ten matches be found before a positive identification can be made."

regarding how much information a latent print must contain to match a rolled print. *Infra*, pp. 46-59.

4. “[G]eneral acceptance can . . . have a bearing on the inquiry.” *Daubert*, 509 U.S. at 594. There is no relevant scientific community in which an answer to “how much is enough?” is accepted. *Infra*, pp. 59-64.

5. “[W]hether the theory or technique has been subjected to peer review and publication.” *Daubert*, 509 U.S. at 593; see also *Lanigan*, 419 Mass. at 26-27.

“[S]ubmission to the scrutiny of the scientific community is a component of ‘good science,’ in part because it increases the likelihood that substantive flaws in methodology will be detected.” *Daubert*, 509 U.S. at 593. No answer to the question of “how much is enough” has ever been presented in a peer review publication. *Infra*, pp. 64-67.

Furthermore, even if the Commonwealth had established these criteria for general latent print identification procedures, it completely failed to establish any reliability for the process used herein known as “simultaneous” latent fingerprint identification. *Infra*, pp. 67-68.

#### **ARGUMENT**

Each of three aspects, permanence, uniqueness, and

sufficiency, must be proven for the Commonwealth to meet its burden of establishing that latent prints can demonstrably and reliably be individualized by comparison to a known full print.<sup>9</sup> Stated otherwise, a formulation must be included of what quantity and quality of latent print is required to justify the identification. Mitchell, Stoney,<sup>10</sup> pp. 88-91. Given the fragmentary, distorted nature of latent prints, combined with documentation of numerous matching points of comparison from different individuals, the focus of the inquiry must be whether individualization of a latent fingerprint is demonstrably reliable, *i.e.*, how much detail must be demonstrable to reliably assert the

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<sup>9</sup> The Commonwealth's position - that fingerprints are permanent and unique, and therefore latent fingerprint analysis is reliable (Meagher, M.Tr., *passim*) - is incomplete. While if valid these two principles by themselves may arguably justify opinion evidence as to the identity of one full print compared to another full print, to address the question of when a latent print matches a full print, the third criterion, sufficiency, is necessary.

<sup>10</sup> Dr. David Stoney is the Director of the McCrone Research Institute in Chicago, Illinois. Mitchell, Stoney, p. 36. He holds a Ph.D. in Forensic Science from the University of California at Berkeley and he did his dissertation on the subject of a quantitative assessment of fingerprint individuality. *Id.* That work was subsequently published as *A Critical Analysis of Quantitative Fingerprint Individuality Models*, 31 J. of Forensic Sci. 1187 (1986) (Ex. 12), which Dr. Stoney co-authored with Dr. John I. Thornton.

uniqueness of the latent print *vis a vis* the known print. The trial court effectively ignored this crucial determinant, noting only that there is a "sliding scale" of quantity versus quality that is considered. Findings, pp. 9-10. The crucial failing of being unable to answer this question has since been demonstrated in this very case by the FBI report indicating there is insufficient detail in the latent prints to make an identification, a finding consistent with the opinion of defendant's examiner. App. \*\*\*.

If there were a reliable, scientific manner of answering the question "How much is enough" such disputes would not occur.

This Court reviews a trial court's decision on the admissibility of expert testimony on an abuse of discretion standard. *Canavan's Case*, 432 Mass. 304, 311-312 (2000). Such a review includes a review for errors of law. *Canavan's Case*, 432 Mass. 304, 317 (Greaney, J., concurring); see *Commonwealth v. Ruiz*, 442 Mass. 826, 833 (2004) (question of expert's qualifications will only be reversed on abuse of discretion or error as a matter of law); *Commonwealth v. John*, 442 Mass. 329, 338 (2004) (reviewing admission of evidence for abuse of discretion or error of law).

Herein, the trial judge both abused her discretion and committed errors of law, and the evidence must be excluded.

It is the Commonwealth's burden, as the proponent of the evidence, to establish "the reliability or validity of the underlying scientific theory or process" of latent fingerprint individualization. *Lanigan*, 419 Mass. at 26 (1994). Trial courts have a "gatekeeping" obligation to ensure that only "demonstrably reliable" expert testimony be presented to jurors. *Id.*; *Kumho Tire v. Carmichael*, 526 U.S. 137, 147 (1999) ("In *Daubert*, this Court held that Federal Rule of Evidence 702 imposes a special obligation upon a trial judge to ensure that any and all [expert] testimony . . . is not only relevant, but reliable.") (quoting *Daubert*, 509 U.S. at 589).<sup>11</sup> "[A]

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<sup>11</sup> Rule 702 of the Massachusetts Proposed Rules of Evidence is identical to Fed. R. Evid. 702: "If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or other education, may testify thereto in the form of an opinion or otherwise." In announcing its decision to not adopt the Proposed Rules, the S.J.C. stated: "The proposed Rules have substantial value as a comparative standard in the continued and historic role of the courts in developing principles of law relating to evidence. Parties are invited to cite the Proposed Rules, wherever appropriate, in briefs and memoranda submitted." SJC-2787, December 30, 1982.

party seeking to introduce scientific evidence may lay a foundation either by showing that the underlying scientific theory is generally accepted within the relevant scientific community, or by showing that the theory is reliable or valid through other means.”<sup>12</sup> *Commonwealth v. Vao Sok*, 425 Mass. 787, 796 (1997) (quoting *Commonwealth v. Sands*, 424 Mass. 184, 185-186 (1997)).

In *Lanigan*, 419 Mass. at 25-26, the S.J.C. held that a trial court, when faced with a proffer of expert testimony, “has a gatekeeper role” in determining “the reliability of the expert evidence.” See also *Daubert*, 509 U.S. at 592-593 (the court must determine if the “reasoning or methodology underlying the testimony is scientifically valid . . .”). Significantly with respect to fingerprint identification, the Supreme Court held that this standard applies both to “novel scientific techniques” and to “well established

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<sup>12</sup> To the extent that a pre-*Lanigan* case, *Commonwealth v. Ghee*, 414 Mass. 313 (1993), states that some fingerprint evidence is not subjected to the older *Frye* test because it is based on personal observation, the S.J.C. specifically rejected that portion of the *Ghee* holding, and applied *Lanigan* to expert personal observation testimony. *Canavan’s Case*, 432 Mass. 304, 313 at n. 4 (2000) and surrounding text. See also *Kumho Tire*, 526 U.S. at 157.

propositions.” *Id.* at 592, n. 11.<sup>13</sup> The S.J.C. adopted the basic reasoning of *Daubert* and *Kumho Tire* because “it is consistent with our test of demonstrated reliability.” *Lanigan*, 419 Mass. at 26; see also *Canavan’s Case*, 432 Mass. 304, 313 (2000).

While all fingerprints, both inked and latent, are subject to various types of distortions and artifacts, the most common being pressure distortion from when the print is deposited, “the problems with latent prints are more acute because they are smaller, and left more carelessly than full-rolled prints, and are often left on surfaces that other fingers have also touched.” *Mitchell*, 365 F.3d at 221. The issue at bar is framed by the fact that “[c]riminals do not leave behind full fingerprints on clean, flat surfaces. Rather, they leave fragments that are often distorted or marred by artifacts . . . . These 'latent' prints . . . are the

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<sup>13</sup> Federal trial court judges have begun to reassess the various forensic identification fields. See *United States v. Santillan*, No. CR 96-40169DLJ, 1999 WL 1201765, \*3 (N. D. Cal. 12/3/99) (“the government is correct in their assertion that pre-*Daubert/Kumho Tire* Ninth Circuit precedent supports the admissibility of this [handwriting expert] testimony, however, the world has changed.”); *Williamson v. Reynolds*, 904 F. Supp. 1524, 1554-1559 (E. D. Okla. 1995) (holding that under the criteria of *Daubert*, hair identification evidence should not have been admitted despite the existence of pre-*Daubert* case law accepting it); Ex. 17, p. 52.

typical grist for the fingerprint identification expert's mill." *Id.* at 220-221, citing Andre Moenssens et al., *Scientific Evidence in Civil and Criminal Cases*, § 8.08 at 514 (4<sup>th</sup> ed. 1995);<sup>14</sup> Starrs, M.Tr. 1/30, 39-40; Meagher, M.Tr. 3/101.<sup>15</sup>

Significantly, distortion can cause a ridge characteristic to appear as something other than what it really is. Ex. 7 at 82; Ex. 12, David A. Stoney & John I. Thornton, *A Critical Analysis of Quantitative Fingerprint Individuality Models*, 31 J. of Forensic Sci. 1187, 1193 (1986); Starrs, M.Tr. 1/43-45, 56-57.<sup>16</sup> Two prints, whether full or latent, taken from the same

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<sup>14</sup> Professor Starrs is one of the four co-authors of this treatise. Ex. 48, pp. 3-4.

<sup>15</sup> See also Ex. 6, p. 153 (David Ashbaugh, *Premises of Friction Ridge Identification, Clarity and the Identification Process*, 44 J. of Forensic Identification 499 (1994)). Other distortions can be caused by the shape of the surface on which the print has been deposited and by the mediums used to develop and lift the print (David Ashbaugh, *QUANTITATIVE - QUALITATIVE FRICTION RIDGE ANALYSIS: AN INTRODUCTION TO BASIC AND ADVANCED RIDGEOLOGY*, pp. 94-95) (hereafter "*Basic and Advanced Ridgeology*"; portions of this work were introduced herein as Exhibit 7), and "the loss of some detail when a three dimensional fingerprint is deposited on a two dimensional surface." Mitchell, Ashbaugh, pp. 107, 147-148, 160.

<sup>16</sup> For example, powder used to develop a latent print may cause a ridge ending to appear to be a bifurcation. Ashbaugh, *Basic and Advanced Ridgeology*, *supra* at 120-121.

finger at different times will contain dissimilarities, due to differences in pressure, the presence or absence of dust, and other distortion-producing factors. Starrs, M.Tr. 1/45-46, 49; Meagher, M.Tr. 3/136; Mitchell, Ashbaugh,<sup>17</sup> p. 162. There have been no studies done to determine the frequency with which such distortions occur.

Different people can share a number of fingerprint ridge characteristics in common. Exhibit 13 discusses fingerprints from two different people that contain seven matching characteristics. Ex. 13, p. 150 (Y. Mark and D. Attias, *What is the Minimum Standard of Characteristics for Fingerprint Identification*, 22 *Fingerprint Whorld* 148 (Oct. 1996)) ("[A]n expert with many years of experience behind him" could make a false identification when comparing two such prints). See also Ex. 14, p. 132 (James W. Osterburg, *THE CRIME LABORATORY: CASE STUDIES OF SCIENTIFIC CRIMINAL INVESTIGATION* (1967)) (referring to fingerprints from different individuals that have ten characteristics in common). In *United States v. Parks*, No. CR-91-358-JSL (C.D. Cal.

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<sup>17</sup> Sgt. Ashbaugh is a staff sergeant with the Royal Canadian Mounted Police with more than twenty-five years of experience as a latent fingerprint examiner, and a published author in the field of fingerprints. Mitchell, Ashbaugh, pp. 80, 83-84.

Dec. 11, 1991), Steven Kasarsky, certified by IAI, who was formerly employed and trained by the FBI, testified that instances of ten points of similarity from prints of two different people occur and he personally had observed six points of similarity from different persons. Ex. 8, pp. 568-569, 575, 599-600, 602 (*Parks* transcript). There have been no scientific studies that can reasonably predict the probability of such events occurring.

For the past 100 years, law enforcement has claimed that latent fingerprint identification is scientific evidence, as the Commonwealth continues to assert herein. See, e.g., Meagher M.Tr. 3/91-92. While the defendant disputes that fingerprint analysis is a science, see, e.g., S.Aff. ¶ 19; Starrs, M.Tr. 1/16; Mitchell, Stoney p. 87, whether or not resulting identifications are "scientific," as opinion evidence they are subject to the rules governing admissibility of expert testimony:

There is no logical reason why conclusions based on personal observations or clinical experience should not be subject to the *Lanigan* analysis. "That a person qualifies as an expert does not endow his testimony with magic qualities." *Boston Gas Co. v. Assessors of Boston*, 334 Mass. 549, 579 (1956). Observation informed by experience is but one scientific technique that is no less susceptible to *Lanigan* analysis than

other types of scientific methodology. The gatekeeping function pursuant to *Lanigan* is the same regardless of the nature of the methodology used: to determine whether "the process or theory underlying a scientific expert's opinion lacks reliability [such] that [the] opinion should not reach the trier of fact." *Commonwealth v. Lanigan*, 419 Mass. 15, 26 (1994).

*Canavan's Case*, 432 Mass. at 313.<sup>18</sup>

The Commonwealth's latent fingerprint identification evidence in the case at bar fails each determinative factor identified by the United States Supreme Court and the Supreme Judicial Court.

**A. WHETHER THE "THEORY OR TECHNIQUE ... CAN BE (AND HAS BEEN) TESTED." DAUBERT, 509 U.S. AT 593 (EMPHASIS ADDED); SEE LANIGAN, 419 MASS. AT 25-26.**

The trial court found that the only test presented by the Commonwealth of whether a latent print contained sufficient material to be matched to fully rolled prints in a reliable manner did not support that such

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<sup>18</sup> See, e.g., *Commonwealth v. Hunter*, 426 Mass. 715, 718-19 (1998) (considering whether to exclude expert fingerprint testimony based on the destruction of the underlying fingerprint); *Commonwealth v. Bartolini*, 299 Mass. 503, 513 (1938) (analogizing friction ridge experts to other experts); see also Ex. 25, pp. 694-698 (Simon Cole, "Witnessing Identification: Latent Fingerprint Evidence and Expert Knowledge," 28 *Social Studies of Science* Volume 5-6) (discussing early defense attempts to claim fingerprint evidence should simply come in without expert testimony, as photographs of the latent and full prints for the jury to compare unaided, which the courts rejected).

identifications can be made. Findings, p. 19. The court also found that because two experts can both examine a given latent and potentially challenge each others conclusions, the testability criterion is met.<sup>19</sup> Findings, p. 20. However, that one examiner may opine differently from another does not mean that either has sufficient evidence to actually develop a reliable opinion. As explained extensively in the testimony and writings of Simon Cole, examination of actual latent fingerprints does not qualify as scientific testing because the true answer as to who left the latent print is not known. Mitchell, Cole, p. 22; Mitchell, Stoney, pp. 120-121. See *infra*, pp. 62-64, n.58 (discussing the error of analyzing the results of the *Mitchell* survey by presuming the existence of false negatives rather than false positives). The trial court abused its discretion in finding that this criterion was met, and in fact, it supports exclusion of the evidence.

The lack of empirical testing is manifest in the

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<sup>19</sup> The trial court also, inexplicably, relied upon the one discrepancy rule in support of this criterion. Findings, p. 20. While the one discrepancy rule provides a way to test whether a latent does *not* match a rolled print, it says nothing about what quantity and quality of latent print is needed to establish a match. Furthermore, the application of this "rule" in practice is questionable at best. See *infra*, p. 54-56.

report of the IAI "Standardization Committee," which had been formed to determine "the minimum number of friction ridge characteristics which must be present in two impressions in order to establish positive identification." Ex. 20, p. 1 (*IAI Standardization Committee Report* (1973)). Conceding that "no valid basis exists for requiring a predetermined minimum number of friction ridge characteristics which must be present in two impressions in order to establish positive identification," *Id.* at 2. Of course, no "valid" basis exists to set a minimum number because the requisite scientific testing has never been performed. See Ex. 17, Stoney, *Fingerprint Identification*, p. 71 ("Indeed, the absence of valid scientific criteria for establishing a minimum number of minutiae has been the main reason that professionals have avoided accepting one."). The IAI strongly recommended that "a federally funded in depth study should be conducted, in order to establish comprehensive statistics concerning the frequency, type and location of ridge characteristics in a significantly large database of fingerprint impressions." Ex. 20, p. 2.

In March 2000, twenty-seven years later, the

National Institute of Justice ("NIJ"), a division of the Department of Justice, issued a Solicitation offering a \$500,000 grant to conduct fingerprint validation studies in two fundamental areas:

1. "[b]asic research to determine the scientific validity of individuality in friction ridge examination based on measurement of features, quantification and statistical analysis," Ex. 1 at 4, because "the theoretical basis for . . . individuality has had limited study and needs additional work to demonstrate the statistical basis for identifications." *Id.*
2. development of standard procedures for fingerprint comparisons and for testing of those procedures once they are adopted. *Id.*

The Solicitation provided that "[p]rocedures must be tested statistically in order to demonstrate that following the stated procedures allows analysts to produce correct results with acceptable error rates." *Id.* (emphasis added). As the NIJ conceded, such testing "has not yet been done." *Id.* (emphasis added). This Solicitation was withdrawn contemporaneous with the first fingerprint challenge in Mitchell, but a new NIJ Solicitation has just issued containing language somewhat less troublesome from the prospective of law

enforcement, which seeks to retain the *status quo*.<sup>20</sup>

The NIJ Solicitation effectively admits: 1) latent fingerprint analysis fails the primary criteria of science and, by extension, the primary criteria for admissibility under *Daubert* and *Lanigan*; 2) there has been no testing of the field's fundamental underlying premises; 3) there has been no testing to determine how frequently different people have ridge characteristics in common or how many of such characteristics they may share; and 4) there has been no testing to assess the reliability of an identification made from a distorted latent fingerprint fragment.<sup>21</sup> See Ex. 1; Starrs, M.Tr. I/49-51.

Statistical models of when a latent fingerprint contains enough information to make a reliable individualization in comparison to a full print have been formulated. Exhibit 61, an article by Dr. David Stoney, one of the witnesses herein, describes ten

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<sup>20</sup> See NIJ Solicitation for Proposals, Quantitative Research on Friction Ridge Patterns, issued January 5, 2005 (subsequent to the hearing in the trial court). Addendum\*\*\*, R. \*\*\*.

<sup>21</sup> As the court in *Parks* found, if no studies exist, "then this is not a science and there are no experts in it." Ex. 8, p. 556.

proposed statistical models,<sup>22</sup> starting with Galton's work in 1892 and continuing with models up to the present, including Dr. Stoney's own model and a model initiated by S.A. Meagher. Ex. 61, Contents, pp. 1-2; M.Aff. ¶ 10. Stoney notes that the models focus on Class 2 characteristics as a "convenient summary of a comparison" and thus necessarily overlook some information. Ex. 61, Limits of Traditional Points of Comparison, p. 7. See, Meagher, M.Tr. 3/83-84. Stoney concludes that "the scientific foundation for fingerprint individuality is incredibly weak. ... [The models] vary considerably in their complexity, but in general there has been much speculation and little data." Ex. 61, Conclusions, p. 55.

As Stoney testified, "[the statistical models] have been put forth as reasonable guesses, or speculation, but none of them have been tested." Mitchell, Stoney, p. 119. Nonetheless, it is clear that fingerprints are susceptible of quantitative analysis to address the fundamental question of sufficiency - how much similarity is enough to form an

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<sup>22</sup> One of these models, the Henry-Balthazard model, is a collection of several subsidiary models. Ex. 61, The Henry-Balthazard models, pp. 12-14.

opinion and at what probability.<sup>23</sup> Stoney has drawn the analogy to DNA models:

[T]here is no justification [for fingerprint identifications] based on conventional science: no theoretical model, statistics or an empirical validation process.

Efforts to assess the individuality of DNA blood typing make an excellent contrast. There has been intense debate over which statistical models are to be applied, and how one should quantify increasingly rare events. To many, the absence of adequate statistical modeling, or the controversy regarding calculations brings the admissibility of the

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<sup>23</sup> A validly tested model could potentially produce conservative guidelines for when sufficient information is present in a latent fingerprint to make an individualization, Ex. 61, Discussion of Champod and Margot Model, p. 49, and thereby provide a ceiling principle, analogous to that endorsed for DNA in *Lanigan*, while more detailed statistical models are refined. Compare *Lanigan*, 419 Mass., at 27 ("Application of the ceiling principle in this case increased the probability of a match from only one in more than 2,000,000 . . . to a range of one in 311,000 to one in 108,000.") (internal citations omitted). Many countries have set arbitrary standards based on a minimum number of points of comparison, Ashbaugh, *Basic and Advanced Ridgeology*, supra at 145, in order to try to prevent erroneous identifications. Ex. 27 (K. Luff, *The 16-Point Standard*, 16 *Fingerprint Whorld* 73 (Jan. 1990)); Starrs, M.Tr. 1/68-69. For example, Argentina and Brazil require 30 matching characteristics; England had a minimum standard of 16 matching characteristics; Italy 17; France and Australia 12. Ex. 9, p. 138, (Champod, *Numerical Standards and "Probable" Identifications*); Robert Epstein, *Fingerprints Meet Daubert: The Myth of Fingerprint "Science" Is Revealed*, 75 S.Cal.Law.R. 605, 636 n. 172 (internal citations omitted). England adopted a non-numerical standard, i.e., no minimum number of comparison points, on June 11, 2001. *United States v. Plaza*, 188 F. Supp.2d 549, 566-571 (Ed.D. Pa. 2002).

evidence into question. Woe to fingerprint practice were such criteria applied! As noted earlier, about a dozen models for quantification of fingerprint individuality have been proposed. None of these even approaches theoretical adequacy, however, and none has been subjected to empirical validation . . . . Indeed, inasmuch as a statistical method would suggest qualified (non-absolute) opinions, the models are rejected on principle by the fingerprint profession.

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Much of the discussion of fingerprint practice in this and preceding sections may lead the critical reader to question "Is there any scientific basis for an absolute identification?" It is important to realize that an absolute identification is an opinion, rather than a conclusion based on scientific research. The functionally equivalent scientific conclusion (as seen in some DNA evidence) would be based on calculations showing that the probability of two different patterns being indistinguishably alike is so small that it asymptotes with zero . . . . The scientific conclusion, however, must be based on tested probability models. These simply do not exist for fingerprint pattern comparisons.

Ex. 17, *Stoney, Fingerprint Identification*, p. 72.<sup>24</sup>

The lack of empirical testing deprives fingerprint comparisons of demonstrated reliability. See *Lanigan*,

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<sup>24</sup> See also Ex. 18, *Saks, Merlin and Solomon*, pp. 1087-1088 ("[I]n forensic science there has been a leap from notions of probability to belief in a doctrine of unique individuality . . . . [T]he various forensic identification sciences have not taken the trouble to collect data on populations of forensically relevant objects so that the probability of erroneous matches can be calculated. Instead, examiners implicitly assume the odds are one-to-infinity.").

at 25-26; *Daubert*, 509 U.S. at 593 ("Scientific methodology today is based on generating hypotheses and testing them to see if they can be falsified; indeed, this methodology is what distinguishes science from other fields of human inquiry.") (internal quotations and citations omitted). Without such testing, no statement of the likelihood of a match can be made. The fingerprint examiner's response is that due to the nature of fingerprints there are three possible results in any comparison - identification, exclusion, and no result - and that a match, if opined, is 100% guaranteed, such that statements of probability are banned and inappropriate.<sup>25</sup> Mitchell, Ashbaugh, p. 192; Meagher, M. Tr. 3/114-115. Examiners make this claim absent any meaningful tests in support, and this absolutist position is inherently incredible. Indeed, Ashbaugh concedes that there is a continuous grade in the amount of information present in a latent print. Mitchell, Ashbaugh, p. 191. Under these circumstances,

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<sup>25</sup> The Commonwealth claimed below, absent citation to any source, that fingerprints cannot be analyzed as to probability of a match due to the variety of detail in a fingerprint. Despite a plethora of detail in DNA, however, it has been reliably determined that precise comparative probabilities can be based upon a very limited number of alleles. Further, use of statistical models hardly precludes human evaluation as well.

the claim of a bright line point at which a latent print goes from unmatchable to 100% guaranteed is manifestly unreasonable and unreliable.

Attempting to demonstrate that testing has been done on the questions of uniqueness and reliability, the Commonwealth presented only one statistical study, the 50/50 study, which S.A. Meagher helped design. M.Aff., ¶ 10; Meagher, M.Tr. 3/71-72. On cross-examination, however, Meagher, a high school graduate, Ex. 54, conceded he is not a statistician and was unable to explain the meaning of the results. Meagher, M.Tr. 5/59-60. In response to this study, Defendant introduced the testimony and articles of Dr. David Stoney, who studied statistics at the graduate level, published peer reviewed articles on statistics, and co-edited a book on the use of statistics in forensic sciences. Mitchell, Stoney, p. 44. Dr. Stoney excoriates this study.

First, 50,000 full fingerprints from the F.B.I.'s data base were each compared, both to itself and to the other 49,999 full prints in the study. Ex. 61, Meagher, Budowle and Ziesig Model, p. 51. The process was then repeated, comparing the central 21.7% of each image, purportedly representing a simulated latent

print, with the 50,000 original images. *Id.*, p. 52. From these tests, the authors claimed that the odds of two full prints being identical was one in  $10^{97}$ . *Id.* This result is, in Dr. Stoney's words, "fundamentally inaccurate" and "very misleading." Mitchell, Stoney, p. 113. The study is "fundamentally flawed" because when comparing two different full prints from the same finger, the test does not show them as identical. Mitchell, Stoney, pp. 247-248. This anomaly results because the test "ignores the variability present in different impressions of the same finger."<sup>26</sup> Ex. 62, p. 17 (Pankanti, *et al.*). In doing so, it "grossly underestimates the probability" of a match between prints from two different fingers. *Id.*

The test was supposed to consist of 50,000 discrete prints, *i.e.* all from different fingers, but in fact there were at least 3 sets of two different prints from the same finger,<sup>27</sup> resulting in at least

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<sup>26</sup> Even 2 prints from the same finger, rolled or latent, will have dissimilarities. Starrs, M.Tr. 1/45-46, 49; Meagher, M.Tr. 3/136; Mitchell, Ashbaugh, p. 162.

<sup>27</sup> As Stoney points out "we do not know how many pairs of different prints from the finger are present among the 50,000. Three pairs were uncovered, but only because of the unusually high Z scores. There could well be more." Ex. 61, Meagher, Budowle and Ziesig Model, p. 55. One of the discovered pairs was not

six comparisons of a print to another print from the same finger. Ex. 61, Meagher, Budowle and Ziesig Model, pp. 52-54. Of these six comparisons, three, or 50%, were indistinguishable from comparisons between prints of two different fingers.<sup>28</sup> *Id.*, p. 54. In other words, in viewing the statistics for these three comparisons, one or more prints from different fingers matched the exemplar print better than the other print from the same finger. Since a latent and a full print are by definition two different prints, Meagher's study shows that a latent may be a better match to a full print from a different finger than it is to a full print made by the same finger that made the latent. In Stoney's words, "[t]his renders the model worthless for documenting the individuality of fingerprints" and instead shows that it is impossible to reliably distinguish between two different prints from the same finger and prints from two different fingers. *Id.*, pp. 54-55. Where, as in this study, the prints being

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discovered in the initial comparisons, but only in the second set of comparisons of the central 21.7% of the prints. Ex. 61, Meagher, Budowle and Ziesig Model, p. 53.

<sup>28</sup> The other three comparisons were somewhat closer matches than comparisons between prints of different fingers, but "tremendously lower" matches than a print to itself. *Id.*, p. 54.

compared are similar to one another, Meagher, M.Tr. 3/73, a latent print may match best with a fingerprint that did not come from the same finger that left the latent print.

In addition to this fatal flaw, Stoney identifies three more fundamental theoretical errors in the study:

1. Use of selected portions of the full prints to simulate latent prints is "thoroughly discredited," Ex. 61, p. 55:

This approach fails to emulate the real world of operational fingerprint comparison in that no distortion of any kind is introduced - neither spatial nor topological. The search print is actually a piece of the matching file print image. Again, this tests the system's ability to match pieces of identical images, not different images made by the same finger.

*Id.*, p. 55, quoting Sparrow, M.K., *Measuring AFIS Matcher Accuracy*, *The Police Chief*, April 1994, p. 147.

2. In determining the purported probability of two fingerprints being identical to be one in  $10^{97}$  (Meagher, M.Tr. 3/78),<sup>29</sup> Meagher and his co-

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<sup>29</sup> The Commonwealth also presented estimates attempting to show that no two fingerprints could be alike because all the "different statistics and probabilities ... exceed the world's population of

investigators simply assumed, with no testing, that the data should be fitted to a "bell curve," rather than some other form of curve. Without testing to support this assumption, the purported probability number is simply a guess. Ex. 61, pp. 55-56.

3. The 50/50 study committed a "basic error" by claiming the odds that a fingerprint would ever match another can be derived by simply multiplying the claimed figure for how often any two fingerprints will match, one in  $10^{97}$ , by the

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fingers." Meagher, M.Tr. 3/83-84. These estimates are unreliable speculation, not data. Ex. 61, Conclusions, p. 55. Even if credited, they do not support the Commonwealth's theory. There are approximately 6.3 billion people in the world, with approximately 63 billion ( $6.3 \times 10^{10}$ ) fingerprints. Meagher, M.Tr. 3/77. When considering only twelve points of comparison, 6 of the 12 probabilities given are lower than the total number of fingerprints, ranging from Galton's model in 1892 to Osterberg's in 1980. Ex. 62, Table 2, p. 14. The lowest of these probabilities, Galton's, is only  $9.54 \times 10^{-7}$ , or approximately 1 in a million. *Id.* This would result in approximately 60,000 fingerprints that match to twelve points of comparison for each fingerprint in the world, a result which if verified by adequate testing would clearly vitiate the reliability of individualization. Further, there is evidence of a genetic component to fingerprints, that similar fingerprint patterns run in families, which has never been seriously studied in the literature. (S.Aff., ¶ 36.). This would make it more likely that of those 60,000, some of them could be relatives of the person who actually left the latent print.

number of fingerprints in the world.<sup>30</sup> *Id.*, p. 56. It was an abuse of discretion for the trial court to credit a study so rife with fundamental errors. The Commonwealth failed to prove that latent fingerprint individualization can be and has been tested, and the trial court erred in finding that this *Lanigan/Daubert* criterion weighed in favor of the admissibility of fingerprints.

**B. THE "KNOWN OR POTENTIAL RATE OF ERROR" OF A PARTICULAR TECHNIQUE SHOULD "ORDINARILY" BE CONSIDERED. DAUBERT, 509 U.S. AT 594; SEE ALSO COMMONWEALTH V. ROSIER, 425 MASS. 807, 813-815 (1997); LANIGAN, 419 MASS. AT 27.**

The trial court correctly rejected the Commonwealth's claim that the error rate of the ACE-V methodology is zero.<sup>31</sup> Findings, p. 22. However, despite unrebutted evidence of significant error rates, the trial court found that the error rate was "quite low." Findings, p. 22. In so holding, the court relied

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<sup>30</sup> A frequently used example of this error is the so-called "birthday problem" - although the odds of any two people sharing the same birthday is roughly one in 365, the odds that two people in a room of 30 people will share a birthday is over 70%, (*Id.*, p. 56), not the 30/365 or 8.2% that would be derived from the method used in the 50/50 study.

<sup>31</sup> ACE-V is an acronym for Analysis, Comparison, Evaluation, Verification, Starrs, M.Tr. 1/25; Meagher, M.Tr. 3/49, which describes the recommended process for comparison of a latent print to a full print, Meagher, M.Tr., *passim*.

on 1) a misinterpretation of two FBI studies; 2) an improper evaluation of the importance of the history of fingerprint usage in trial courts; and 3) the unfounded assumption that ACE-V is more reliable than other forms of expert opinions. This determination was unsupported by the evidence and an abuse of discretion.

1. Defendant Proved High Error Rates

The failure to establish "a known or potential rate of error" has been explicitly conceded in the NIJ Solicitation. Ex. 1, p. 4 ("procedures must be based ... on more than community-based agreement. Procedures must be tested statistically in order to demonstrate that following the stated procedures allows analysts to produce correct results with acceptable error rates. This has not yet been done."). There is substantial reason to suspect that if the NIJ validation studies are ultimately conducted (the initial NIJ solicitation was withdrawn after the government defeated the fingerprint challenge in *Mitchell*, but has been reissued in revised form, Add. \*\*\*), if error rates can be established, they will be significant. There have been numerous documented cases of erroneous fingerprint

identifications.<sup>32</sup> See Ex. 24, p. 110.

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<sup>32</sup> The most recent, discovered subsequent to the hearing herein, is the case in which the FBI wrongly identified Attorney Brandon Mayfield as matching a latent fingerprint discovered in a terrorist attack in Madrid, Spain. *In Re: Federal Grand Jury*, U.S. Dist. Ct., Dist. Oregon, Docket No. Misc. 04-9071.

Cases cited at the hearing herein include the Michael Cooper case in Arizona, the Caldwell case in Minnesota, the Shirley McKie case in Scotland, and the Ricky Jackson case in Pennsylvania. S.Aff. ¶ 52; Starrs, M.Tr. 1/73-74, 78, 81-82; Ex. J (Haber, Lyn and Haber, Ralph Norman, "Error Rates for Human Latent Fingerprint Examiners" Automatic Fingerprint Recognition Systems, edited by Nalini Ratha and Ruud Bolle, Springer-Verlag: New York, Chapter 17), pp. 351-352.

For example, in *State v. Caldwell*, 322 N.W.2d 574 (Minn. 1982); see also Ex. 21 (James E. Starrs, *A Miscue in Fingerprint Identification: Causes and Concerns*, 12 J. of Police Sci. & Admin. 287 (1984)). The prosecution's fingerprint examiner in *Caldwell*, a board certified member of the IAI with more than 14 years of experience, testified that a particular latent print at issue in the case had been made by the defendant's right thumb. Ex. 21, p. at 288. The examiner based his opinion on 11 points of similarity that he found. *Id.* A second fingerprint examiner, also a board certified member of the IAI, confirmed the first examiner's finding, after being consulted by the defense. *Id.* Following the defendant's conviction for murder, however, it was definitively established that both of these certified fingerprint examiners had erred; the latent print was not a match. *Caldwell*, 322 N.W.2d at 585. The defendant's conviction was reversed. *Id.*

For other documented cases of false identifications, see James E. Starrs, *More Saltimbancos on the Loose? - Fingerprint Experts Caught in a Whorl of Error*, 12 Sci. Sleuthing Newsl. 1 (Winter 1998) (detailing several erroneous identifications discovered in North Carolina and Arizona); see also Dale Clegg, *A Standard Comparison*, 24 Fingerprint Whorld 99, 101 (July 1998) ("I am personally aware of wrong identifications having occurred under both 'non numeric' and '16 point' approaches to fingerprint

While crime lab accreditation proficiency tests do not constitute controlled scientific studies, they do provide some indication of the state of the fingerprint "profession." Examiners are provided with latent prints and with "ten-print" inked impressions with which to compare. Commencing in 1995, the test provider, Collaborative Testing Service, included one or two "elimination" latent prints made by an individual whose ten-print inked impressions had not been furnished. The results of the 1995 exam were, in the words of a leading law enforcement examiner, "alarming" and "chilling." Ex. 2, p. 524. Of the 156 examiners, only 68 (44%) were able to correctly identify the five latent print impressions that were supposed to be identified and able to correctly note the two elimination latent prints that were not to be identified. Most significantly, 34 examiners (22%) made erroneous identifications on one or more of the questioned prints for a total of 48 misidentifications. *Id.* Erroneous identifications occurred on all seven latent prints that were provided, including 13 errors made on the five latent prints that could be correctly identified to the supplied suspects. *Id.* In addition,

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identification.").

one of the two elimination latent prints was misidentified 29 times. *Id.*

These revealing results could not be blamed on the test.<sup>33</sup> The 1995 exam was recognized as being "a more than satisfactory representation of real casework conditions." *Id.* The test was designed, assembled and reviewed by representatives of the IAI. *Id.* As Grieve correctly observed, a "proficiency test composed of seven latents and four suspects was considered neither

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<sup>33</sup> A study providing similar results was performed by two British researchers who were commissioned by the British Home Office to review the sixteen points of comparison standard then governing in both England and Wales. See Ex. 33. The researchers sent ten pairs, each consisting of one latent and one set of inked fingerprints, with the request that examiners of ten or more years of experience undertake the comparisons independently of each other. *Id.*, p. 58. Nine of the pairs were taken from past casework of Scotland Yard that had been identifiable to one another. The tenth pair consisted of two prints made by different fingers. The examiners were asked to decide whether the latent print in each pair was identifiable and if so, the number of corresponding points that could be seen. The variation in the responses received from the 130 participants was extraordinary. With respect to one pair, the number of reported points of comparison ranged from ten to forty. *Id.*, p. 59. As to another pair, the range was fourteen to fifty-five. *Id.*, p. 60. There was considerable disagreement as to whether identifications could properly be effectuated. As to one pair, 44% of the examiners found that an identification could be made; 56% said it could not. *Id.*, p. 61. The researchers understandably concluded that "the variation [in the responses] confirms the subjective nature of points of comparison." *Id.* "[E]xperts vary widely in their judgment of individual points." *Id.*, p. 65.

overly demanding or unrealistic.” *Id.* Despite Grieve’s call for “positive action,” *id.* at 524-525, the poor results have continued unabated on more recent proficiency exams. On the 1998 test, for example, only 58% of the participants were able to correctly identify all of the latent prints and to recognize the two elimination latent prints as being unidentifiable. Ex. 3, p. 2. More telling, 21 erroneous identifications were made by 14 different participants.<sup>34</sup> *Id.* The trial court credited these results and found them “disturbing.” *Findings*, p. 23.

The Commonwealth’s only defense to these poor results was to separate error rate into two sub-types, “methodological” error rate and “practitioner” error rate, and claim that the “methodological” error rate is zero. M.Aff. ¶ 12; Meagher, M.Tr. 3/24. The trial court correctly rejected the implausible claim of a methodological zero error rate, but abused its discretion in asserting the error rate was nonetheless “quite low.” *Findings*, p. 22.

## 2. The Flawed FBI Studies

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<sup>34</sup> On the 1997 exam, 16 false identifications were made by 13 participants. Ex. 4, p. 2 (Collaborative Testing Services, Inc., Report 9708, *Forensic Testing Program: Latent Prints Examination* (1997)).

The first study relied on by the Court in analyzing error rates arose from the fingerprint challenge brought in *United States v. Mitchell*, Cr. No. 96-00407 (E.D. Pa. 1999). At issue were two latent fingerprints that the government recovered from a getaway car. In response to Mitchell's *Daubert* challenge, the government sent the two latent prints, along with Mitchell's ten-print card, to 53 law enforcement agencies, requesting that "court qualified" examiners compare the prints. Meagher, M.Tr. 3/27, 29. The government did not advise the agencies that the FBI had already opined that the latent prints could be matched to Mitchell's left and right thumbs.<sup>35</sup> Of the

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<sup>35</sup> The government did advise the agencies of the extreme importance of their cooperation, and expressly stated a bias in favor of buttressing fingerprint evidence. The cover letter that accompanied the request, Ex. 34, provided, in pertinent part:

The FBI needs your immediate help! The FBI laboratory is preparing for a *Daubert* hearing on the scientific basis for fingerprints as a means of identification. The Laboratory's Forensic Analysis Section Latent Print Unit, is coordinating this matter and supporting the Assistant United States Attorney in collecting data needed to establish this scientific basis and its universal acceptance. . . . The time sensitive nature of these requests cannot be expressed strongly enough, nor can the importance of your cooperation. The potential impact of the Federal court not being convinced of the scientific basis for fingerprints providing individuality has far-reaching and

40 responding agencies, nine (23%) reported that either one or both of the latent prints were not identifiable with any of the fingers on Mitchell's ten-print card. Meagher, M.Tr. 4/33-43, Ex. 34A; Ex. 58.<sup>36</sup> The government then sent the nine "non-compliant" agencies a second mailing with a new form, requesting that it be returned after re-examination of the prints. Meagher, M.Tr. 4/43-44. The second mailing also provided the agencies with enlargements of the fingerprints with plastic overlays marked with the points of comparison deemed relevant by the FBI.<sup>37</sup> Meagher, M.Tr. 4/43-44.

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potentially negative ramifications to everyone in law enforcement. The FBI wishes to present the strongest data available in an effort to insure success in this legal matter and your cooperation is a key component in achieving this result.

Although the government asserted that the solicitation did not try to focus the other labs toward a desired result, significantly, while the FBI frequently sends 10-print cards to other agencies seeking the identity of suspects, it had never done so seeking to exclude a suspect. Meagher, M.Tr. 4/27-29.

<sup>36</sup> The Commonwealth's presentation, by testimony and via a Powerpoint slide of a table containing the results, simply stated that all agencies made an identification, Meagher, M.Tr. 3/29; Ex. 58; the fact of the nine initial findings of no identification was only revealed on cross-examination, and production by the defendant herein of the original table of results. Meagher, M.Tr. 4/33-46; Ex 35.

<sup>37</sup> Ashbaugh made clear in *Mitchell* that this mailing was not scientifically sound. Mitchell, Ashbaugh, pp. 211-212.

The trial court's analysis that the initial results constituted 9 false negatives, rather than 31 false positives, Findings, pp. 11, 22, is unsupported because we do not know who left the latent print; the trial court could only have assumed they were Mitchell's latent prints because a greater number of respondents so found. This survey merely tested whether fingerprint examiners tend to agree with each other when presented with a suggested match, not whether they tend to be correct. The possibility that the identifications reported in this study were merely ratifications of the FBI's identification claim is greatly strengthened by the fact that, in response to the FBI's "highly suggestive second mailing," Findings, p. 11, all nine jurisdictions initially reporting no match reversed themselves, finding the points of comparison contained on the plastic overlays.<sup>38</sup> Id.; Meagher, M.Tr. 4/51. It is manifest that this solicitation and the results generated from it were demonstrably unreliable.

The trial court also erred in finding that the

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<sup>38</sup> Enforcement of unanimity of opinion among examiners is rigidly enforced, Ex. 56, pp. 4-5, and made easier because the necessary combination of quantity and quality is never made concrete.

50/50 study did not return any false positives. Although it did not match a particular image to anything other than itself, on the few occasions where two images of the same finger were included in the sample, fifty percent of them were better matches to images from one or more different fingers than to the other image of the finger they were from. In actual practice, these would all constitute false positives. See *supra*, pp. 30-31. A fifty percent error rate cannot be considered low.

3. Prior Court Use Does Not Establish Low Error Rates

The trial court also improperly relied on prior in-court cases as constituting testing of fingerprint identification reliability. Findings, p. 22. Prior cases at most test whether juries credit fingerprint testimony more or less than other types of evidence. A case in which a jury rejects alibi evidence in favor of fingerprint evidence to convict does nothing to “prove” a low error rate of fingerprint identification, merely that the jury chose to rely on the identification, whether or not it was accurate. See *infra*, pp. 63-64. Indeed, if juries could be relied upon to discard unreliable opinion evidence, the trial court’s entire gatekeeper function as established by *Lanigan* and

*Daubert* would be unnecessary.

4. ACE-V Is Not Inherently Reliable

ACE-V is merely new terminology for what examiners always have done over the history of fingerprint analysis. Meagher, M.Tr. 3/46. This "perfect" methodology simply describes the process by which any two items are visually compared, Meagher, M.Tr. 3/46: one analyzes each item's components, puts the items side by side to compare, and then makes a decision based on what is seen. Meagher, M.Tr. 3/46. If simply using an acronym to describe this process created an error-free methodology, then "error-free methodologies" could exist for determining if two paintings were done by the same artist, absent any scientific testing, or any other visual comparison anyone cared to make. Such a conclusion would render this *Lanigan/Daubert* criterion meaningless.<sup>39</sup>

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<sup>39</sup> At one point, Meagher implied the methodology is error free because there is a single correct conclusion to the question of whether a given finger left a particular latent print. Meagher, M.Tr. 3/125. While only one finger *actually* left a particular latent print, this is not the same as staying that only one finger *could have* left a particular latent print. The research to establish that only one finger could have left a print, or that there is enough data in a latent print to determine which finger left that print, has simply not been done. Further, the fact that a question has a correct answer does not imply that there is an errorless method to find that answer, and

The trial court's assertion that this comparative methodology's error rate is "certainly far lower" than opinions as to the diagnosis of a disease or the likelihood of a particular factory being the source of a pollutant, Findings, p. 22, was without foundation in the evidence. There was no evidence whatsoever as to the error rates of either of these forms of opinion, and the evidence regarding fingerprint error rates placed these rates at 40-50%. The Court's assertion that fingerprint error rates must be lower, as with its assertion that the FBI's *Mitchell* study showed false negatives rather than false positives, was based solely on an underlying bias that fingerprint identifications are generally valid and have a low error rate. It was

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certainly does not prove that the particular method being used to find the answer is errorless. There are correct answers to the questions "Who killed Nicole Simpson?" and "Did Lee Harvey Oswald act alone?", but there are no errorless methodologies to find those answers.

Meagher's attempted analogy of ACE-V to arithmetic, M.Aff. ¶ 12; Meagher, M.Tr. 3/124, 125, 128, 130, is fundamentally flawed, because at no point in the methodology of arithmetic is there a step saying "and then the person adding, based on his subjective experience as an adder, decides the answer." Unlike fingerprint analysis, arithmetic is based solely on *objectified* premises, which is why calculators provide a definitive answer, and why AFIS systems objectively produce only a set of possible results for the fingerprint examiner's subjective consideration. Meagher, M.Tr. 3/89-90.

an error of law and an abuse of discretion to import this presumption into the findings and effectively require defendant to prove a high error rate, rather than properly burdening the Commonwealth to prove a low error rate, which it failed to do.

**C. THE "EXISTENCE AND MAINTENANCE OF STANDARDS CONTROLLING THE TECHNIQUE'S OPERATION." DAUBERT, 509 U.S. AT 594; SEE ALSO ROSIER, 425 MASS. AT 812-815; LANIGAN, 419 MASS. AT 26-27.**

The trial court found that no standard exists for determining when a latent print contains sufficient quantity and quality of information to justify an individualization, and that the scientific research necessary to establish such a standard has not been done. Findings, p. 23. the trial court then relied on two irrelevant standards to find that this criterion weighed in favor of admissibility. Findings, pp. 23-24. This was an abuse of discretion.

The first "standard" the trial court relied upon was the "one discrepancy" rule. Not only is this rule honored principally in the breach, see *infra*, pp. 54-56, but it fails completely to address the fundamental question of "how much is enough." The one discrepancy rule only allows the declaration that a match has failed, it says nothing about when a match has succeeded, and therefore cannot be employed to

establish a standard to answer that question.

The purported rigorous training of the FBI is even less on point.<sup>40</sup> While a court should consider the quality of training when evaluating an area of claimed expertise, a surfeit of training cannot remedy defects in reliability of the underlying field. Well trained astrologers, phrenologists, or polygraph operators are still not allowed to testify, because their underlying field lacks the necessary reliability. It was an abuse of discretion to conflate the test for whether an individual expert should be qualified with the actual question: whether latent fingerprint identification is a reliable field of endeavor with appropriate standards. It is not.

Examiners operate in the absence of uniform objective standards,<sup>41</sup> the most glaring with respect to the ultimate question: what constitutes a sufficient basis for a positive identification? Lacking accepted standards based upon valid research, each agency and

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<sup>40</sup> Defendant notes that the examiner in this case whom the Commonwealth seeks to call as a witness does not work for the FBI, and the FBI has stated that there is no match.

<sup>41</sup> See *Parks*, where the court found there were no fingerprint identification standards and thus ruled the fingerprint evidence unreliable and inadmissible. Ex. 8, *Parks* transcript at 587, 591-592, 606-607.

every examiner have their own arbitrary requirements for the minimum number of points of comparison they deem necessary to offer an absolutely certain fingerprint identification.<sup>42</sup> Ashbaugh, *Basic and Advanced Ridgeology*, p. 145; see also Ex. 9, p. 138; Ex. 26, pp. 3-4. As Ashbaugh candidly acknowledges, a fingerprint examiner's opinion of identification is "very subjective." Ex. 6, p. 511. Further, determination of whether there is a sufficient basis for individualization is left entirely to the subjective judgment of an examiner who is invariably part of the prosecution;<sup>43</sup> bias can skew the test results. See *Commonwealth v. A Juvenile*, 365 Mass. 421, 445 (1974) (4-3 decision) (Quirico, J., dissenting), *overruled by Mendes*, 406 Mass. at 212. "Experts" who declaim it is enough when it is sufficient, and it is sufficient when it is enough are not demonstrably reliable.

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<sup>42</sup> Prior to the IAI's 1973 report, see *supra* p. 22, the informal standard most commonly employed in the United States was 12. See Ex. 5, p. 6, FBI, *Fingerprint Identification*. The FBI still uses this standard for quality control. Meagher, M.Tr. 5/20.

<sup>43</sup> Training in finger print examination comes from law enforcement agencies, so all examiners are either law enforcement or retired law enforcement. Mitchell, Cole, p. 16.

While the arbitrary point system routinely employed over the past ninety years lacks scientific support, no one has advanced a scientifically sound and reliable alternative.<sup>44</sup> Instead, they have advanced an acronym for what they do, ACE-V. At no step in this methodology is there any standard other than the examiner's personal opinion when there is sufficient quality and quantity to move to the next step and ultimately whether an individualization can be opined. Starrs, M. Tr. 1/28; Meagher, M.Tr. *passim*.

In the analysis stage, the examiner looks at what level one, level two and level three characteristics are present in the prints to be compared. Meagher, M. Tr. 3/49. The Commonwealth has not advanced any standards used to determine the presence or absence of these characteristics; indeed, there is not even agreement as to what to call the different type two

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<sup>44</sup> The proper response to a lack of support for the old rules is to do the research to determine if the rules hold true, not to give up on rules altogether. As stated by the dissent in *U.S. v. Crisp*, 324 F.3d 261, 272 (4<sup>th</sup> Cir. 2003) (Michael, J., *dissenting*), the state has had a decade since *Daubert* to provide satisfactory support to meet its burden with regard to the admissibility of latent fingerprint evidence, and it has failed to do so. *Id.*

characteristics.<sup>45</sup> Mitchell, Ashbaugh, p. 137; see Ex. 25, p. 698 (regarding the ability of a trained examiner to craft what is seen in the image). Ashbaugh described the process of "teasing the points" by which an examiner could "see those other ridge characteristics" which Ashbaugh did not believe were present.<sup>46</sup> Mitchell, Ashbaugh, p. 173.

Similarly, in the comparison stage, the examiner looks at the "totality" of the characteristics to determine if there is a discrepancy. Meagher, M. Tr. 3/57, 59. As discussed *infra*, pp. 54-56, there are no grounds or standards on which the distinction between a dissimilarity and a discrepancy can be drawn. In the evaluation phase, a final decision on individualization is reached. Meagher, M. Tr. 3/57. Again, Meagher

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<sup>45</sup> Without standards, there is no way to tell if the characteristics have been correctly identified. "Since latent prints are typically of very poor quality, it is possible that there could be an error in judgment of existence of minutiae in the latent.... The effect of such misjudgments on the probability of a false correspondence is rather dramatic." Ex. 62, p. 33. "[T]he misjudgment of a false minutiae match has significantly more impact than that of missing genuine minutiae in the input latent print." Ex. 62, p. 35.

<sup>46</sup> Although Ashbaugh discussed this process in the context of a point system, it is inherent in any analysis system based upon the examiner's subjective judgment, such as ACE-V.

provides no grounds for a making this decision.<sup>47</sup>

Meagher, M. Tr. 3/57-59.

Finally, in the verification phase, another examiner repeats this standardless procedure. Meagher, M. Tr. 3/59, 4/106. Not only does such a verification not add standards to the prior procedure, are done in a lax and haphazard manner, knowing the identity of the suspect, Meagher, M.Tr. 4/123, and that an identification has already been made, Starrs, M.Tr. 1/34-37; Meagher, M.Tr. 4/105-106 - in effect, it is a ratification, not a verification. See *U.S. v. Plaza*, 188 F. Supp. 2d 549, 559 (E.D. Pa. 2002).

Without specific, tested objective standards, the explanations of what a fingerprint examiner does are hopelessly circular, as articulated by Ashbaugh, explaining how a latent fingerprint examiner "knows" when a sufficient basis exists to make an identification:

A frequently asked question is how much is enough? The opinion of individualization or identification is subjective. It is an

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<sup>47</sup> Indeed, on cross-examination, Meagher stated that because ACE-V is a holistic process, it is not even truly possible to separate the phases. Meagher, M.Tr. 4/125-126, 135-145. Since the *only* function that ACE-V provides as a "methodology" is a separation of the phases of the examination, if it does not even do that, it is reduced to mere verbiage.

opinion formed by the friction ridge, based on the friction ridge formations found in agreement during comparison. The validity of the opinion is coupled with an ability to defend the position, and both are founded in one's personal knowledge ability and experience.

\* \* \* \*

How much is enough? Finding adequate friction ridge formations in sequence, that one knows are specific details of the friction skin, and in the opinion of the friction ridge identification specialist there are sufficient uniqueness within those details to eliminate all other possible donors in the world, is considered enough. At that point individualization has occurred and the print has been identified. The identification was established by the agreement of friction ridge formations, in sequence, having sufficient uniqueness to individualize.

David Ashbaugh, QUANTITATIVE - QUALITATIVE FRICTION RIDGE ANALYSIS: AN INTRODUCTION TO BASIC AND ADVANCED RIDGEOLOGY, p. 103 (emphasis in original); Mitchell, Ashbaugh p. 142 ("... the frequently asked question is how much is enough? The opinion of individualization or identification is subjective."). The utter meaninglessness of this explanation is manifest. The "standard" (or clairvoyance) by which the examiner divines "sufficient uniqueness" and employs it to "eliminate all other possible donors in the world" is not revealed, and is simply left to the examiner's opinion.

The recent attempts by SWGFAST to set standards

for conclusions are similarly unsatisfactory: "[t]he standard for individualization is agreement of sufficient friction ridge details in sequence," Ex. 56, p. 1, is another tautological response to the question "How much is sufficient?"<sup>48</sup> When pressed to set forth an explanation of their methods, the fingerprint examiners again reply simply "we are the experts. Trust us."<sup>49</sup> It is precisely because examiners cannot articulate the standardless, subjective determination of individualization that they are trained to testify in court to the counting of points of comparison, a rejected methodology, "to demonstrate an identification...." M.Aff. ¶ 8; Meagher, M.Tr. 5/24-28. This court would not accept

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<sup>48</sup> The subsidiary conditions to be satisfied are no better, stating simply:

1. Determined by a competent examiner, and
2. Applied to a common area in both impressions, and
3. Based on quantity and quality of the friction ridge details, and
4. Absent any discrepancy, and
5. Reproducible conclusion.

Ex. 56, p.1. Of these "standards," three say nothing about what constitutes a sufficiency (1.1.2, 1.1.4 and 1.1.5); one simply repeats that a sufficiency is needed (1.1.3), and the last places the determination squarely on the examiner, with no guidelines for his decision, (1.1.1).

<sup>49</sup> The adoption of this mystique of the expert as a final defense has been part of fingerprint testimony from the beginning. Ex. 25, p. 698.

that in any other field, and should not accept it from this one.

Objective standards are lacking throughout the entire comparison process. There are no standard rules or measurements to guide examiners in determining whether a particular characteristic in one print sufficiently matches a characteristic observed in another, what constitutes the standard ridge characteristics, what weight is given any specific characteristic, or even whether some types of characteristics count as one or as two. S.Aff., ¶ 27; Ex. 46, p. 99; Starrs, M.Tr., 1/58-67; Ashbaugh, Mitchell, p. 173. When examiners find themselves struggling to reach a certain point criteria, they often engage in a practice known as "pushing the mark." Ex. 46, p. 99. Pursuant to this practice, a single characteristic, such as a short ridge, is counted not as one point, but rather as two separate ridge endings. *Id.*; Starrs, M.Tr., 1/58-67; Ashbaugh, Mitchell, p. 173.

The only rule that fingerprint examiners seem to have, the "one dissimilarity doctrine" (if two fingerprints contain one unexplained dissimilarity, they are not a match), is effectively ignored in

practice. See Ex. 29; see also Ex. 30, p. 510.

However, as Dr. Thornton, a trained fingerprint analyst and leading forensic science commentator, notes, once a fingerprint examiner finds what he or she believes is a sufficient number of matching characteristics to make an identification, the examiner will often explain away any acknowledged dissimilarity as being a product of distortion or artifact:

Faced with an instance of many matching characteristics and one point of disagreement, the tendency on the part of the examiner is to rationalize away the dissimilarity on the basis of improper inking, uneven pressure resulting in the compression of a ridge, a dirty finger, a disease state, scarring, or super-imposition of the impression. How can he do otherwise? If he admits that he does not know the cause of the disagreement then he must immediately conclude that the impressions are not of the same digit in order to accommodate the one-dissimilarity doctrine. The fault here is that the nature of the impression may not suggest which of these factors, if any, is at play. The expert is then in an embarrassing position of having to speculate as to what caused the dissimilarity, and often the speculation is without any particular foundation.

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The practical implication of this is that the one-dissimilarity doctrine will have to be ignored. It is, in fact, ignored anyway by virtue of the fact that the fingerprint examiners will not refrain from effecting an identification when numerous matching characteristics are observed despite a point of disagreement. Actually, the one-dissimilarity doctrine has been treated rather shabbily. The fingerprint examiner

adheres to it only until faced with an aberration, then discards it and conjures up some fanciful explanation for the dissimilarity.

Ex. 29, p. 91; see also Ex. 17, p. 65 ("In fingerprint comparison judgments of correspondence and the assessment of differences are wholly subjective: there is no objective criteria for determining when a difference may be explainable or not."); Ex. 25, p. 698.

In discussing this doctrine Meagher identified six factors which could cause dissimilarities that were not discrepancies, but provided no means for telling when any of those factors were present other than the experience of a trained examiner. Meagher, M.Tr. 3/100-102. Sgt. Ashbaugh admitted that even if the cause of the dissimilarity could not be explained, the dissimilarity could be ignored if "you know [] this is an identification" (Mitchell, Ashbaugh, pp. 164-165), although he would not bother to make up a reason. *Id.*, pp. 164-165, 166. The lack of objectivity in these examinations is exemplified by the fact that examiners do not conversely seek to explain similarities, *i.e.*, whether a characteristic suggestive of a match is also a distortion or an anomaly. Starrs, M.Tr. 1/83-85.

The absence of real standards also is manifested

by the verification stage, deemed an essential part of the identification process. But, in real life practice, fingerprint agencies sometimes "waive the verification requirement." Ex. 31, p. 1. Some examiners simply go from one supervisor to another until a desired verification is obtained. Ex. 32, p. 153. Pat Wertheim candidly recounts his own experience of shopping for a supervisor to obtain the positive verification that he believed was warranted.<sup>50</sup> *Id.*

Finally, the lack of standards in the fingerprint community extends to the training and experience required of latent print examiners. Traditionally, there were no requirements, see Ex. 31, as Wertheim recognizes: "people are being hired directly into latent print units without so much as having looked at a single fingerprint image."<sup>51</sup> Ex. 32, p. 152.

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<sup>50</sup> It must be noted that verification is never done on a "blind" basis. The verifying examiner, invariably a member of the same law enforcement agency, is informed of the original examiner's identification before performing the verification. Ex. 32, p. 153.

<sup>51</sup> The lack of training and standards has not only resulted in a plethora of deficient examiners, but dishonest ones as well. Wertheim, a fingerprint examiner himself, estimates that there have been "hundreds or even thousands" of cases of forged and fabricated latent prints. Ex. 39, Pat Wertheim, *Detection of Forged and Fabricated Latent Prints*, 44 *J. of Forensic Identification* 653, 675 (1994) ("A disturbing percentage of experienced examiners polled

Although new standards for the training of latent print examiners have been proposed by SWGFAST, these standards are only being applied prospectively to new examiners, not to those already practicing. *Compare* Ex. 56 with Meagher, M.Tr. 3/144.

In light of the lack of hiring standards, it is critical that standards for competence testing be employed. Again, no standards exist. Competence testing is organized individually by each lab or examiner, and frequently done on a voluntary basis or absent entirely. S.Aff., ¶¶ 38-39. It is often organized on an in-house basis rather than by an independent testing service, resulting in numerous pressures that are likely to inflate test performance, such as the examinee's knowledge a test is being taken and the supervisors of the test's stake in its results. Ex. J, p. 353. There is also no agreed upon measure for how hard such tests should be.<sup>52</sup> Ex. J, p. 348.

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by the author described personal exposure to at least one of these cases during their careers.").

<sup>52</sup> In particular, outside reviewers have stated that the FBI internal competency test is so easy, it could be passed with six weeks of training. Ex. J for ID, p. 353. A former examiner for New Scotland Yard testified that the FBI's proficiency tests were so easy and unrepresentative of real crime-scene latent prints, that if he had given these tests to his experts, "they'd fall about laughing." *United States v. Plaza*,

As discussed *supra*, pp. 36-39, the CTS competency tests demonstrated an abysmal failure rate.

The trial court abused its discretion in determining that this *Lanigan/Daubert* criteria supports the admissibility of latent fingerprint evidence.

D. "[G]ENERAL ACCEPTANCE CAN ... HAVE A BEARING ON THE INQUIRY." *DAUBERT*, 509 U.S. AT 594; *SEE ALSO ROSIER*, 425 MASS. AT 814-816; *LANIGAN*, 419 MASS. AT 26.

1. Fingerprint Examiners Do Not Constitute a Relevant Scientific Community

The trial court appropriately recognized that the relevant scientific community "must not be defined so narrowly that the expert's opinion will inevitably be considered generally accepted." Findings, p. 16, *citing Canavan's Case*, 432 Mass. at 314, n.6. It abused its discretion, however, in finding that the fingerprint examiner community is sufficiently broad.

There has never been a relevant scientific community that has shown any sort of general acceptance for the proposition that latent fingerprint identifications are reliable. As courts have recently recognized, in defining a relevant scientific community, it is necessary to look beyond the

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188 F. Supp.2d 549, 557-558 (E.D. Pa. 2002).

practitioners of the technique under assessment.<sup>53</sup>

The defendant's experts, all with years to decades of experience studying fingerprint examinations (Ex. 48; Mitchell, Stoney, p. 39, 62; Mitchell, Cole,<sup>54</sup> p. 8),<sup>55</sup> are members of precisely the sort of disinterested, academic community whose acceptance is required. In contrast, even an intellectually curious examiner such as David Ashbaugh is unwilling to examine the fundamental premises of the field. See Mitchell, Ashbaugh, p. 215 ("Well, all fingerprints are unique, so why have a probability study on agreement of those

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<sup>53</sup> *Williamson v. Reynolds*, 904 F. Supp. 1529, 1558 (E. D. Okla. 1995) ("Not even the 'general acceptance' standard is met, since any 'general acceptance' seems to be among hair experts who are generally technicians testifying for the prosecution, not scientists who can objectively evaluate such evidence."); *Starzecpyzel*, 880 F. Supp. at 1038 ("[Forensic Document Examiners] certainly find general acceptance within their own community, but this community is devoid of financially disinterested parties, such as academics.").

<sup>54</sup> Dr. Simon Cole holds a Ph.D. in science and technology studies from Cornell University, and was a post-doctoral fellow at Rutgers University at the time of his testimony. His dissertation was on the history of criminal identification methods from photography to fingerprinting, and resulted in two published articles introduced as exhibits herein. Mitchell, Cole, pp. 4-6; Ex. 25, 26.

<sup>55</sup> Dr. Stoney also has significant experience in examining latent fingerprints and comparing them to full prints, and had testified as to identifications and exclusions in other cases. Mitchell, Stoney, pp. 55-57.

features?"). Nowhere in the evidence is there a defense of latent fingerprint examinations by such an independent observer.<sup>56</sup>

In addition to the fact that fingerprint examiners have a vested interest in preserving the admissibility of fingerprint evidence, see Ex. 34, fingerprint examiners are also uniquely trained not to disagree with each other. Mitchell, Cole, p. 10. For instance, Meagher testified on cross-examination that if two examiners disagree in looking at a particular print, one of them is considered improperly trained. Meagher, M.Tr. 4/97-101. If an examiner persists in an opinion in disagreement with a colleague, the SWGFAST conflict resolution guidelines suggest "immediate removal from latent fingerprint casework" and/or that the examiner should receive counseling, Ex. 56, pp. 4-5; Meagher, M.Tr. 5/53, in order, according to S.A. Meagher, to determine if there was a "death in the family or some

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<sup>56</sup> The Commonwealth's only possible such witness, Dr. Babler, testified to the uniqueness and permanence of full prints, but had not studied latent fingerprint identifications, Mitchell, Babler, p. 75, and made no claims about latent prints or the ability to make an individualization from them. Dr. Babler is an administrative dean at Marquette University School of Dentistry. Previously he held professorships at several other universities. His master's and doctoral degrees are from the University of Michigan in physical anthropology. Mitchell, Babler, pp. 5-8.

other factor there that we need to know about and counsel that individual to say if you're having these kinds of problems in your life, maybe you shouldn't be conducting the work right now, we'll give you a leave of absence." Meagher, M.Tr. 5/54. In the face of such draconian methods of enforcing unanimity, general acceptance of latent fingerprint examination must come from outside the field to have any meaning.

Such acceptance cannot be found from the broader field of forensic science. Until recently, mainstream scientists have ignored the question of whether individuals can be reliably identified through latent fingerprint impressions. Ex. 18, p. 1081. The forensic science experts who have examined the issue have found the fingerprint field to be scientifically deficient. *Id.*, p. 1106 ("A vote to admit fingerprints is a rejection of conventional science as a criterion for admission."); Ex. 17, p. 55 ("[B]y conventional scientific standards, any serious search for evidence of the validity of fingerprint identification is likely to be disappointing.") and p. 72 ("[T]here is no justification [for fingerprint identifications] based on conventional science: no theoretical model, statistics or empirical validation

process."); S.Aff., ¶ 19. The Commonwealth has produced no scientists to testify to the reliability of latent print identification.

2. The Courts Are Not A Relevant Scientific Community

The trial court also relied upon the general acceptance of the court system of fingerprint testimony. Findings, pp. 16-17. The question of whether courts *should* accept latent fingerprint evidence is the question to be decided. To circularly rule that simply because courts have accepted fingerprints in the past, they should continue to do so, is an abuse of discretion.

Moreover, this practice of acceptance does not provide a reliable test for latent fingerprint identification. Mitchell, Cole, pp. 21-22. The fundamental reason that analyses in prior court cases do not constitute valid testing is that there is no way to tell if an identification was wrong. Mitchell, Cole, p. 22; Mitchell, Stoney, pp. 120-121. An acquittal of someone implicated by a fingerprint examiner shows at most that the jury did not credit the examiner,<sup>57</sup> not that the examiner was wrong, and any

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<sup>57</sup> It may not even show that, depending on the defense. For instance, a jury could acquit believing

such acquittals, lacking written appeals, are difficult to research and document. Similarly, a conviction based on fingerprint evidence shows only that the jury believed the examiner, not that the examiner was right.<sup>58</sup> Mitchell, Cole, p. 22; see Ex. 26, pp. 13, 15 (contrasting two early cases where judge and jury differed on the accuracy of the fingerprint identification). A faulty exclusion, or a failure to find sufficient quality and quantity to individualize, is even less susceptible to evaluation by the jury and the court system. Mitchell, Ashbaugh, p. 155-156. The history of the use of fingerprints in the court system provides no support to the Commonwealth's position, either by the bootstrapping method of claiming "it's always been accepted, so it should continue to be accepted," or by testing the validity of latent

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that a print on a weapon matched the defendant, if it rejected the prosecution's assertion that it was the weapon used in the charged crime, or accepted the defendant's claim of self-defense.

<sup>58</sup> The general belief in fingerprints is so strong that jurors rank fingerprints as the single most important scientific reason for a conviction, but this belief "does not provide any scientific evidence whatsoever that the fingerprint evidence is correct." Ex. J., p. 344.

fingerprint evaluations in producing convictions.<sup>59</sup>

This *Lanigan/Daubert* criterion also weighs against the admissibility of fingerprints.

**E. "[W]HETHER THE THEORY OR TECHNIQUE HAS BEEN SUBJECTED TO PEER REVIEW AND PUBLICATION." DAUBERT, 509 U.S. AT 593; SEE ALSO LANIGAN, 419 MASS. AT 26-27.**

The trial court correctly rejected the Commonwealth's claim that the "Verification" step of the ACE-V methodology constitutes peer review. Findings, pp. 20-21. However, it abused its discretion by finding, with no basis in the evidence, that "limited" review in forensic publications had occurred, and that such review sufficed to make this factor "slightly" weigh in favor of admissibility. Findings, p. 21.

The fundamental premises underlying latent print identifications have not been critically examined, even in fingerprint community journals:<sup>60</sup>

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<sup>59</sup> Indeed, given their unique training in not disagreeing with each other and the draconian measures imposed on an examiner who does disagree, *supra* pp. 61-62, it is rare even to see two examiners testify against each other in court. Mitchell, Cole, pp. 10-11.

<sup>60</sup> The fact that some fingerprint journals exist does not, by itself, satisfy the peer review factor. Many unreliable fields may have publications, such as polygraphy or astrology. Fingerprint journals do not satisfy any meaningful scientific standards.

it is difficult to comprehend that a complete scientific review of friction ridge identification has not taken place at sometime during the last one hundred years[;] [a] situation seems to have developed where this science grew through default.

Ex. 7, p. 4. The truth of Ashbaugh's comments can be seen by examination of some of the fingerprint publications. In the FBI publication "The Science of Fingerprints," only three of 211 pages concern latent fingerprint comparisons. Ex. 16. In those three pages, there is no discussion as to the fundamental premises that underlie such identifications or even how comparisons should be conducted, and certainly no indication how an examiner could determine when sufficient data exists to form an opinion. As Ashbaugh noted, there is a "lack of published material about the identification process." Ex. 30, p. 508.

Ashbaugh bemoans the "failure of the identification community to challenge or hold meaningful debate." Ex. 7, p. 4. Even when the premises of latent print identifications have been considered in the "technical" literature, they have not been critically examined,<sup>61</sup> as exemplified in this

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<sup>61</sup> "In the past the friction ridge identifications science has been akin to a divine following. Challenges were considered heresy and challengers frequently were accused of chipping at the foundation

argument that fingerprints are unique: "The phrase 'Nature Never Repeats Itself' is often used in support of the basic fingerprint tenet of individuality." Ex. 40, p. 1. Further, even if the premise that fingerprints are unique is accepted *arguendo*, neither the Commonwealth nor the trial court identified any peer reviewed publications which answered the crucial question: how much information is enough to form an opinion? The contrast with the scientific methodology and rigor required of DNA experts is striking.<sup>62</sup>

In sum, the literature of latent fingerprint examiners "fails to meet the expectations of the *Daubert* Court - that a competitive, unbiased community of practitioners and academics would generate increasingly valid science." *Starzecpyzel*, 880 F. Supp. at 1037.

**F. THE USE OF "SIMULTANEOUS" IMPRESSIONS IS TOTALLY WITHOUT FOUNDATION**

All of the above problems are accentuated by use

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of the science unnecessarily. This cultish demeanor was fostered by a general deficiency of scientific knowledge, understanding and self confidence within the ranks of identification specialists. A pervading fear developed in which any negative aspect voiced that did not support the concept of an exact and infallible science could lead to its destruction and the credibility of those supporting it." Ex. 40, p. 1.

<sup>62</sup> See *supra* at pp. 25-27 & n. 23.

of so-called "simultaneous" impressions, *i.e.*, those deemed by the examiner to have been left by one person at the same time. Meagher, M.Tr. 5/54. S.A. Meagher testified that he knows of no studies addressing when simultaneous impressions contain enough information to opine a match, nor had he ever considered how such impressions should be evaluated. Meagher, M.Tr. 5/56-57. No evidence was presented as to how an impression is to be identified as "simultaneous." Ashbaugh describes simultaneous impressions as a weird doctrine used in Britain, but not based in science. Mitchell, Ashbaugh, p. 173-175. In light of a dearth of evidence supporting admissibility of an identification based on "simultaneous" impressions, such evidence would have to be excluded even if this court were to rule in favor of admitting fingerprint evidence generally.

#### **CONCLUSION**

The trial court's ruling must be reversed, and all fingerprint evidence in this case should be EXCLUDED.

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## ADDENDUM

### **A. TECHNICAL DEFINITIONS**

The testimony in this case included numerous technical phrases, not all of which were used by the witnesses in a consistent manner; see Meagher, M.Tr. 4/109:

1. "Full print (also called a rolled print, an inked print, or an exemplar print):" a fingerprint which has been taken under controlled conditions from a known subject, and includes information from the entire surface of the fingerprint area of the finger. These prints are generally collected on "10-cards," *i.e.* a card containing a rolled print from each finger of one individual, along with that individual's identifying information, such as name and birthdate. Starrs, M.Tr. 1/16; Meagher, M.Tr. 2/134-135.
2. "Latent print:" an impression left at the scene of a crime. Starrs, M.Tr. 1/16. Latent prints are often fragmentary (partial), distorted as a result of differing pressures in placement, and smudged or smeared, as a result of dynamic rather than static placement. S.Aff. ¶ 32. Various methods are used to find and develop latent prints, and

these methods can also change the appearance of the latent print. Meagher, M.Tr. 2/143, 3/40. The term "latent" comes from the meaning hidden, not visible. Meagher, M.Tr. 2/143.

3. "Individualization:" the opinion matching of a latent print to one person as its source to the exclusion of all other people in the world. S.Aff. ¶ 19; Meagher, M.Tr. 3/17.
4. "Class 1 Characteristics (also called level 1):" the general ridge flow of a fingerprint. Starrs, M.Tr. 1/52, 54; Meagher, M.Tr. 2/145, 3/49.
5. "Class 2 Characteristics (also called level 2, or 'Galton Points'):" aspects of a particular ridge path, including bifurcations, endings, divisions. Starrs, M.Tr. 1/53; Meagher, M.Tr. 2/148, 3/49.
6. "Class 3 Characteristics (also called level 3):" finer detail concerning individual ridges, such as the shape of the edges, their width, and the presence of pores. Starrs, M.Tr. 1/53; Meagher, M.Tr. 2/150, 3/49.
7. "ACE-V:" an acronym for Analysis, Comparison, Evaluation, Verification. Starrs, M.Tr. 1/25; Meagher, M.Tr. 3/49. ACE-V describes the recommended process for comparison of a latent

print to a full print, Meagher, M.Tr., *passim*, but is merely new terminology for what has always been done. Meagher, M.Tr. 3/46.

8. "IAI:" the initials of the International Association for Identification, a private organization of fingerprint examiners, which attempts to maintain and upgrade the standard for examiners and issues certifications for examiners. Starrs, M.Tr. 1/19.
9. "SWGFAST:" the acronym for the Scientific Working Group on Friction Ridge Analysis, Study and Technology, a group of up to forty fingerprint experts organized by the FBI, beginning in approximately 1995, to develop guidelines and/or standards for fingerprint analysis. Meagher, M.Tr. 3/106-108.
10. "Discrepancy" and "Dissimilarity:" two terms used to describe differences between two fingerprint impressions; a "dissimilarity" is a difference which, in the opinion of the examiner, can be explained, while a "discrepancy" is a difference which cannot be explained, and requires a finding that the fingerprints are not from the same

finger. Meagher, M.Tr. 3/100.<sup>63</sup>

**B. FACTS ADDUCED AT THE LANIGAN/DAUBERT HEARING**

- a. Science is the systematic investigation of the natural phenomena employing the scientific method.
- b. Broadly speaking, the scientific method requires three steps: 1) Forming a hypothesis; 2) Testing the hypothesis; and 3) Evaluation of the hypothesis in light of the testing results.  
S.Aff. ¶ 20; Starrs, M.Tr. 1/74-77.
- c. Objectivity is the key goal of scientific investigation and a fundamental aspect of the scientific method. S.Aff. ¶ 20; Starrs, M.Tr. 1/79-80.
- d. Objectivity requires, *inter alia*, that an unknown be evaluated prior to similar analysis of, and comparison to, a known. S.Aff. ¶ 20.
- e. In the context of latent fingerprint examination, the hypothesis to be tested is that a latent print can be individualized to a full print. S.Aff. ¶ 21. See M.Aff. ¶ 6.

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<sup>63</sup> Some evidence before the trial court used "dissimilarity" for both types of difference, with the adjective "explained" or "unexplained" attached to distinguish them. See, e.g., Starrs, M.Tr. 1/82-84; Ex. 29, John I. Thornton, *The One-Dissimilarity Doctrine in Fingerprint Identification*, 306 Int'l Crim. Police Rev. 89 (March 1997).

- f. While numerous statistical models attempting to demonstrate when a latent print sufficiently matches a full print to make an identification, and the probabilities of a latent print being matched with a known print, have been proposed, the proposed statistical models have generally been flawed and incomplete, Ex. 62, *passim*, and the Commonwealth does not seek to rely upon them.
- g. The proposed statistical models either have not been tested, or, where they have been tested, the resulting data did not sustain the model. Ex. 61; Ex. 62.
- h. The fingerprint community itself has recognized this flaw, as far back as the report of the IAI "Standardization Committee," in 1973, Ex. 20, and as recently as the National Institute of Justice's issuance of a solicitation offering a \$500,000 grant to conduct fingerprint validation studies. Ex. 1.
- i. The test designed by the Commonwealth's witness, S.A. Meagher, referred to as the "50/50 study," is fundamentally flawed. Mitchell, Stoney, pp. 109-118.
- j. No scientific data exist which demonstrate that a

latent print can be reliably individualized.

S.Aff. ¶ 33; Meagher, *passim*; Mitchell, Stoney, p. 87.

- k. Where the results of the Collaborative Testing Service blind tests of various fingerprint experts have been made available, they demonstrate unacceptable rates of error. S.Aff. ¶ 51; Haber, Lyn and Haber, Ralph Norman, "Error Rates for Human Latent Fingerprint Examiners" Automatic Fingerprint Recognition Systems, edited by Nalini Ratha and Ruud Bolle, Springer-Verlag: New York, Chapter 17, pp. 346-348 (Ex. J).
- l. There have been a number of cases where multiple fingerprint experts agreed to an individualization which was later determined to be false, the most recent being the Brandon Mayfield Case in which the FBI positively, but incorrectly, identified a latent print associated with a terrorist bombing in Spain as being that of a lawyer from Seattle, Washington.
- m. The fingerprint community's claim of "infallibility" is fundamentally unscientific. S.Aff. ¶ 53.
- n. The IAI and SWGFAST require that fingerprint

examiners state as an opinion only one of three conclusions: an individualization, an exclusion, or a statement that the latent is insufficient to make a determination. S.Aff. ¶ 54; Meagher, M.Tr. 5/46.

- o. The IAI and SWGFAST forbid any statement of probability in the evaluations, whether numeric or otherwise, in contravention of good scientific practice. S.Aff. ¶ 54; Starrs, M.Tr. 1/33-34, 70-71; Meagher, M.Tr. 5/46-47.
- p. The IAI non-probabilistic approach forces the examiner to state an opinion which may not accurately reflect the conclusions of the examiner, since it compels the examiner to formulate an opinion in a category which may not totally reflect his or her own belief. S.Aff. ¶ 55; Starrs, M.Tr. 1/70-73.
- q. The documentation of fingerprint examination errors is inadequate; there have been no standardized rate-of-error studies and the existence of errors is largely ad hoc and anecdotal. S.Aff. ¶ 46.
- r. No calibration has been established of what is an acceptable or unacceptable rate of error. S.Aff.

¶ 48.

- s. No established statistical norm has been developed, against which fingerprints examinations can be evaluated, which is necessary to determine rates of error. S.Aff. ¶ 48; Ex. J, p. 353.
- t. Fingerprint associations, including the International Association for Identification ("IAI"), recommend against the use of any numerical standard in making an identification, leaving the examiner to his own subjective devices. S.Aff. ¶ 25; Starrs, M.Tr. 1/32-34; M.Aff. ¶ 8.
- u. No standards have been defined even for what constitutes a meaningful proficiency examination. S.Aff. ¶ 49.
- v. No standards exist at all as to when a latent print can be individualized, either in the absolutist manner suggested by the IAI, or in the more scientific, probabilistic method adopted by forensic scientists in other fields, such as DNA. S.Aff. ¶ 34.
- w. Proficiency testing by the independent Collaborative Testing Service is only voluntary, not mandatory, and sporadic in nature, not

standardized. Documentation of these tests is inadequate; unlike in other expert areas, these reviews are private, largely unpublished, and unavailable to the public. S.Aff. ¶ 50.

- x. Current fingerprint examiners generally lack formal academic training. A college degree is now recommended for FBI fingerprint examiners, but current examiners who lack a college degree, including S.A. Meagher, are excused from that requirement. S.Aff. ¶ 37; Starrs, M.Tr. 1/22; Meagher, M.Tr. 3/146; Ex. 56.
- y. Neither membership in nor certification by the IAI, the oversight organization for fingerprint examiners, is a prerequisite for conducting fingerprint comparisons. S.Aff. ¶ 38; Starrs, M.Tr. 1/20. Indeed, S.A. Meagher is not IAI certified. Meagher, M.Tr. 3/142-143; Exhibit 54.
- z. Proficiency testing for examiners is not either uniform or regularized, either within specific laboratories or between laboratories. S.Aff. ¶ 39; Meagher, M.Tr. 4/178-179.
- aa. Proficiency testing should be conducted following the blind or double-blind format, which is consistent with the scientific method. S.Aff. ¶

40.

- ab. Just as conducting fingerprint identifications via analyzing the full print first and then examining the latent print is unscientific because it builds in a bias towards finding the known exemplar reflected in the latent, S.Aff. ¶ 42. See M.Aff. ¶ 6, in order to insure an unbiased result, a true verification must be done by starting anew - analysis of the latent print - prior to examining and considering the known print of a suspect. S.Aff. ¶ 29; M.Aff. ¶ 6.
- ac. The verifier should not even know whether the print being examined has been identified as a match, but should do the entire procedure again, from the beginning. Additionally, there should be an independent verification, not only as to inclusions, which is the current practice, but also as to exclusions. S.Aff. ¶ 29.
- ad. It is critical to the scientific process that both the original examination and any subsequent verifications be documented via contemporaneously taken notes which are retained for later independent review. S.Aff. ¶ 30.
- ae. Present verification procedures are conducted in-

house by someone who knows an individualization already has been made, introducing a bias to sustain the first opinion, rather than conducting a new, blind independent review by a different laboratory or agency. S.Aff. ¶ 31, Starrs M.Tr. 1/85. Verifications are only requested where a match has been opined, not where no match was found. Starrs, M.Tr. 1/37-39.

- af. The current standards utilized to make an identification vary wildly from organization to organization, in a way which makes it impossible for any of those "standards" to be considered scientifically valid, objective standards. S.Aff. ¶ 24.
- ag. Fingerprint examiners fail to consider possible explanations for why similarities might not be valid, in contrast to their practice of explaining away the presence of perceived dissimilarities. S.Aff. ¶ 44.
- ah. Fingerprint examiners tend to emphasize similarities, giving short shrift to dissimilarities. S.Aff. ¶ 43.
- ai. Current latent fingerprint examination practice is not conducted using either the blind or double-

blind format. S.Aff. ¶ 45.

- aj. Fingerprint examiners do not generally stay abreast of current fingerprint developments as reported in the leading scientific journals, e.g., regarding DNA analysis of fingerprints and interpapillary lines. S.Aff. ¶ 41.
- ak. Examiners frequently and routinely testify to the number of points of comparison they find to validate claims of individualization. S.Aff. ¶ 25; M.Aff. ¶ 8.
- al. The subjectivity of the evaluation extends not only to the number of points of comparison that is needed to make an individualization, but also to the question of what the points of comparison are and the weight to be attributed to them. S.Aff. ¶ 26; Starrs, M.Tr. 1/56-67.
- am. For instance, bifurcations, ending ridges, and dots (short ridges) are very common elements of a fingerprint pattern and are generally utilized. S.Aff. ¶ 26.
- an. Other, rarer types of points of comparison include bridges, trifurcations, and spurs, as well as interpapillary lines and ridge dimension and pore variations, which are not identified and used

generally, let alone uniformly. S.Aff. ¶ 26;  
Starrs, M.Tr. 1/54, 58, 62-66.

ao. Some configurations are identified differently by different examiners. For instance, an island (a short length or ridge surrounded by ridges on either side) is sometimes considered one point, and sometimes considered two ending ridges.

S.Aff. ¶ 27; Starrs, M.Tr. 1/60-61.

ap. The current state of latent fingerprint matching "methodology" is overly subjective, leaving it up to the individual examiner to make a determination without any scientifically-established guidelines and standards. S.Aff. ¶ 22; Starrs, M.Tr. 1/28, 32-34, 78.

aq. The subjective nature of the methodology necessarily introduces examiner bias into the process. S.Aff. ¶ 22.

ar. The subjective nature of the methodology also makes the skills and training of the examiner of paramount importance to the determination of the validity of the individualization. Meagher, M.Tr., *passim*; Mitchell, Ashbaugh, p. 186.

as. Fingerprints have been used as a method of identification in court for approximately 100

- years. M.Aff. ¶ 3.
- at. The history of use of fingerprint evidence in courts of law does not establish reliability. Mitchell, Cole, pp. 21-22.
- au. There is no acceptance of latent fingerprint identification by a community of experts outside of fingerprint examiners themselves. Ex. 18, pp. 1090-1094.
- av. Peer review has a specific meaning in the scientific arena, which is not simply presenting a conclusion and receiving commentary from one's peers. Mitchell, Stoney, p. 42; Mitchell, Cole, p. 25.
- aw. The fingerprint community is lacking in proper peer review. Mitchell, Cole, p. 24.
- ax. The failure of the fingerprint community's verification practices to be done in a blind, independent manner is fundamentally unscientific. S.Aff. ¶ 28.
- ay. In comparing latent fingerprints to rolled or inked fingerprints, latent fingerprint identification lacks 1) uniformity, 2) peer review, 3) empirically sound, controlled experiments to validate the methodology, 4)

opinions framed in probabilistic form, 5) a rate of error, and 6) falsification experiments, all of which are components of the scientific method.

S.Aff. ¶ 23.

- az. The methodology currently used to match latent prints to full prints is unscientific and unreliable. S.Aff. ¶ 19; Starrs, M.Tr. 1/*passim*.
- ba. The present process of fingerprint comparison and analysis is not predicated on a sound and adequate scientific basis for purposes of individualization. S.Aff. ¶ 19; Starrs, M.Tr. 1/*passim*..