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DIVISION ONE

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No. 67387-4

IN THE COURT OF APPEALS FOR THE STATE OF WASHINGTON
DIVISION I

IN RE THE PERSONAL RESTRAINT PETITION OF:

LESLIE POUNDS,

PETITIONER.

PERSONAL RESTRAINT PETITION

Jeffrey E. Ellis #17139
Attorney for Mr. Pounds

Law Office of Alsept & Ellis, LLC
621 SW Morrison St., Ste. 1025
Portland, OR 97205
(206) 218-7076 (ph)
JeffreyErwinEllis@gmail.com

A. STATUS OF PETITIONER

Leslie A. Pounds (hereinafter "Pounds") challenges his Snohomish County conviction for Aggravated Murder in the First Degree (No. 83-1-00599-4). Mr. Pounds is currently serving a life sentence. His judgment is attached as Appendix A. He is presently incarcerated at the Reformatory in Monroe, Washington. (DOC #244545).

This is Pounds' first collateral attack on this conviction. He brings it now based on newly discovered facts.

At his trial, the State offered expert testimony that comparative bullet lead analysis could indisputably prove that a gun linked to Mr. Pounds was the murder weapon. Recently, that testimony was revealed by the same agency that offered it (FBI) to be "junk" science. Counsel for Mr. Pounds' trial strategy would have changed, if he had known the expert testimony was unfounded in science. See *Declaration of Walter Peale* attached as Appendix B.

B. FACTS

Introduction

During his murder trial, the State called an expert witness, a forensic scientist from the FBI, who testified that the composition of metal fragments found in victim's body (from the fatal gunshot) was indistinguishable with live bullets found in a gun discovered in an area under Pounds' exclusive control. The

conclusion from this evidence was obvious—the recovered gun, which could be tied to Pounds, was used to kill the victim.

It is now clear that the so-called comparative bullet lead analysis (CBLA) testimony presented by the State in Pounds’ trial was “junk” science. In fact, the FBI admits it and Pounds does not expect the State to contest it. *See Appendix C.*

The History of Comparative Bullet Lead Analysis

In 2009, the National Academy of Sciences (NAS) published a landmark report on forensic science: *Strengthening Forensic Science in the United States: A Path Forward*. The Report represents one of the most important developments in forensic science since the establishment of the crime laboratory in the 1920s. After two years of studying fingerprints, handwriting, ballistics, and other common forensic techniques, the Academy concluded that “some forensic science disciplines are supported by little rigorous systematic research to validate the discipline’s basic premises and techniques.” Indeed, “only nuclear DNA analysis has been rigorously shown to have the capacity to consistently, and with a high degree of certainty, demonstrate a connection between an evidentiary sample and a specific individual or source.” *See Giannelli, Paul, Daubert and Forensic Science: The Pitfalls of Law Enforcement Control of Scientific Research*, 2011 U. Ill. L. Rev. 53, p. 11-14 (2011); attached as Appendix D.

For over thirty years, FBI experts testified about comparative bullet lead analysis (CBLA), a technique that was first used in the investigation into President

Kennedy's assassination. CBLA compares trace chemicals found in bullets at crime scenes with ammunition found in the possession of a suspect. This technique was used when traditional firearms identification could not be employed because, for example, the bullet was too mutilated or the weapon was not recovered. FBI experts used various analytical techniques (first, neutron activation analysis (NAA), and then inductively coupled plasma-atomic emission spectrometry (ICP-AES)) to determine the concentrations of seven selected elements—arsenic (As), antimony (Sb), tin (Sn), copper (Cu), bismuth (Bi), silver (Ag), and cadmium (Cd)—in the bullet lead alloy of both the crime-scene and the suspect's bullets. Statistical tests were then applied to compare the elements in each bullet and determine whether the fragments and suspect's bullets were “analytically indistinguishable for each of the elemental concentration means.” Exactly what the phrase “analytically indistinguishable” meant was the central issue—in other words, did such a finding mean that the bullet fragments came from a small or large universe? The probative value of the test results would, of course, differ if only one hundred bullets had the same chemical composition as opposed to several million bullets.

The technique was not seriously challenged until a retired FBI examiner, William Tobin, began questioning the procedure in scientific and legal journals and in court testimony as well. As a result, the FBI asked the NAS to review the technique. The NAS appointed a committee of scientists, statisticians, and

attorneys to conduct the review.

One of the first things the committee discovered was the disparate (often inconsistent) interpretive conclusions provided by FBI experts in the reported cases. In some, experts testified only that two exhibits were “analytically indistinguishable.” In other cases, examiners concluded that samples “could have come from the same batch” or source. In still others, they stated that the samples came from the same source.

The NAS Report, published in 2004, undercut much of the FBI testimony. The Report found that the “available data do not support any statement that a crime bullet came from a particular box of ammunition. In particular, references to ‘boxes’ of ammunition in any form should be avoided as misleading under Federal Rule of Evidence 403.”

Much of FBI testimony rested on a database, which the Bureau had built up over the course of many years. Although the NAS Committee frequently asked for this data during its year-long investigation, the FBI did not turn over the data until it was too late to include an analysis of the information in its report. The two statisticians who served on the NAS Committee would later write that their subsequent inspection of the data “identified several peculiarities.” First, the database was incomplete. The FBI claimed to have a “complete data file” of some 71,000+ measurements but only 64,869 were turned over. Moreover, only measurements made by ICP-AES were included; a different analytical method,

NAA, had been used before 1997. Both techniques measured the same elements, and therefore the results from either technique would have been suitable for comparison. Further, the numbering system for the bullets was “highly inconsistent and rather unexpected,” suggesting that some bullet measurements had been deleted. Additionally, “a rough investigation of the measurement error indicated many measurement errors that exceeded the FBI's claimed analytical precision of 2-5%” Finally, “only 15% of the 1,079 cases listed in these two files had measurements from [National Institute of Standards and Technology] . . . making it impossible to determine the frequency of matches” in some cases. Accordingly, the “missing data and the inconsistent precisions” undermined the Bureau's public claims.

As researchers steeped in the traditions of science, these authors were puzzled by the FBI's failure to disclose data. They wrote: “The scientific method is important for science generally; forensic science is no exception. . . . [T]he evidence in this paper suggests that, at least for CBLA, forensic science failed in the requirement to share the materials, methods, and data used to reach conclusions with the scientific community.”

In short, the NAS Committee, appointed at the behest of and funded by the FBI, was not provided with critical data that would have assisted it in evaluating the technique. This data formed the basis of the Bureau's testimony in about five hundred prosecutions, including death penalty and other murder cases.

The FBI's response to the NAS Report was also disconcerting. The Bureau quickly put out a press release, obscuring the Report's findings. The release highlighted the Committee's conclusion that the FBI was using appropriate instrumentation and the correct elements for comparison. Yet these aspects of CBLA were never seriously questioned. Rather, the interpretation of the data was disputed. Only one sentence in the press release addressed this important issue: "Recommendations by the [NAS] included suggestions to improve the statistical analysis, quality control procedures, as well as expert testimony."

The FBI also included the following passage in the press release: "The basis of bullet lead compositional analysis is supported by approximately 50 peer-reviewed articles found in scientific publications beginning in the early 1970's. Published research and validation studies have continued to demonstrate the usefulness of the measurement of trace elements within bullet lead." In contrast, the NAS Report pointed out that there were "very few peer-reviewed articles on homogeneity and the rate of false positive matches" and "[o]utside reviews have only recently been published." In effect, the FBI cherry-picked favorable statements from the Report and downplayed the unfavorable crucial findings.

Over one year later, the FBI discontinued CBLA testing, issuing another press release. Once again, the release minimized the problems, citing the following reason for its decision: "While the FBI Laboratory still firmly supports the scientific foundation of bullet lead analysis, given the costs of maintaining the

equipment, the resources necessary to do the examination, and its relative probative value, the FBI Laboratory has decided that it will no longer conduct this exam.” Nevertheless, a month earlier, Dwight Adams, then laboratory director, had written a memorandum to the FBI Director specifying different reasons for abandoning the technique, including the following comments: (1) “[w]e cannot afford to be misleading to a jury” and (2) “[w]e plan to discourage prosecutors from using our previous results in future prosecutions.” Neither concern was reflected in the press release.

In the wake of the NAS Report, several state courts excluded CBLA evidence. Surprisingly, the FBI supplied affidavits in several cases supporting prosecutors' efforts to sustain convictions based on the technique.

In September 2005, the FBI Laboratory announced that, after extensive study and consideration, it would permanently discontinue the examination of bullet lead. At the time, Congress was briefed and letters outlining the FBI Laboratory's decision to discontinue CBLA were sent to approximately 300 state and local crime laboratories and other agencies that received laboratory reports indicating positive results, as well as the National District Attorney's Association, the National Association of Criminal Defense Lawyers, and the Innocence Project, a litigation and public policy organization. Recipients were provided with a link to the NRC report and asked to provide a copy of the letter to all prosecutors working on any case to which the BLA may relate. The FBI offered to assist

recipients, including assistance with regard to any discovery obligations, and provided name and contact information for experts at the Department of Justice and the FBI Laboratory. State prosecutors were asked to consult with discovery experts or appellate specialists within their office of the State Attorney General's Office to determine the effect of the announcement on their prosecutions. In addition, for all federal cases, the FBI notified its field offices and the Executive Office for United States Attorneys advised those U.S. Attorneys offices where cases had been brought utilizing CBLA testimony.

On November 18, 2007, *60 Minutes* aired a segment on CBLA. In an interview, Dwight Adams, the now retired FBI lab director, acknowledged that testimony about boxes was "misleading and inappropriate." That broadcast, along with a Washington Post investigation, questioned the FBI's response to the NAS Report. The main problem was that only the FBI had records of all the cases in which its experts had testified, and the FBI had declined to disclose the names of those cases. Instead, the FBI relied on the NAS Report, its own press releases, and pro forma letters sent to prosecution and defense organizations to notify defendants. This method of communication was grossly inadequate because the letters neither highlighted the problem nor its significance. A few days after the *60 Minutes* expose, Senator Patrick Leahy, the Chairman of the Senate Judiciary Committee, sent a letter to the FBI Director, noting that the FBI's letters gave "the false impression that these discredited tests had continuing reliability."

Four years after it had discontinued CBLA, in November 2009, the FBI sent a letter to the Snohomish County Prosecutor's Office referencing Mr. Pounds' conviction. That letter states:

A review of the testimony provided by an FBI Laboratory examiner on the subject of compositional analysis of bullet lead was conducted on the transcript that you provided. The goal of the review was to determine if there was a suggestion by the examiner that a bullet fragment or shot pellet was linked to a single box of ammunition without clarification that there would be a large number of other bullets or boxes of bullets that could also match those fragments or shot pellet. Science does not support the statement or inference that bullets, shot pellets, or bullet fragments can be linked to a particular box of bullets. Further, any testimony stating bullets came from the same source of lead is potentially misleading without additional information regarding approximate numbers of other "analytically indistinguishable" bullets that also originated from that same source. Finally, any testimony regarding the geographical distribution of analytically indistinguishable bullets exceeds the data currently available. After reviewing the testimony of the FBI's examiner, it is the opinion of the Federal Bureau of Investigation Laboratory that the examiner did state or imply that the evidentiary specimen(s) could be associated to a single box of ammunition. This type of testimony exceeds the limits of the science and cannot be supported by the FBI.

Later, the letter was forwarded to the Snohomish County Public Defender, who later sent it to Pounds. It is attached to this petition.

Trial Testimony

In this case, the State successfully urged the trial court to admit CBLA evidence as scientifically reliable. Pre-trial motions were held on November 7, 1983. At that hearing, the trial court approved the conclusion that the metallurgical comparison may be similar; it may be possible to conclude that the material came from the same batch – the lead in the bullets and the lead in the

wound may have come from the same batch of manufactured bullets; that it's possible to determine whether different bullets came from the same box.

Defense counsel opposed the admission of the evidence. On November 17, 1983, defense counsel Walter Peale moved to have opinion of the FBI expert stricken and the jury instructed to disregard the testimony concerning comparisons of the elemental analysis of the metal fragments and the two sets of cartridges pursuant to ER 701, 702, 703. RP (11/17/83) 2-4.

After a jury trial, Mr. Pounds was convicted of Aggravated Murder for the September 13, 1983, homicide of John Heazlett. The State alleged that Mr. Pounds kidnapped, robbed, and shot Mr. Heazlett after Heazlett slashed Pounds' tires. The State's case at trial included the testimony of several individuals who testified against Pounds in exchange for certain assurances from the State.

As expected, FBI Special Agent Roger Asbury testified as a witness for the State. He stated that compositional analysis was valuable to criminal investigations because such analysis could answer the question: "Is this something like we would find in bullets originating from the same box, or are they completely different?" RP 568. He later explained that it would be "quite uncommon" to find bullets with similar composition to have originated from "different boxes." RP 569. More specifically, Special Agent Asbury testified that four received bullet fragments had a "very close compositional association" to an unfired bullet and that any differences "are the type that I would find within the

same box among the cartridges." RP 579.

There were several accomplices who testified against Pounds. However, their testimony was suspect. For example, Chris Vaughn testified that Pounds shot the victim, but admitted, "I was worried about being charged with murder because I was there." RP 702, RP 703, RP 707 and RP 791.

Although the testimony of the accomplices was suspect, the science appeared to be beyond reproach. As a result, defense counsel argued two, inconsistent theories to the jury. During closing argument, defense counsel Peale first told the jury that the evidence supported the conclusion that Mr. Heazlett was shot by another (Chris Vaughn) while Pounds was present. RP 2461 – 2473, RP 2480. However, defense counsel then argued that Pounds was so intoxicated that he did not possess the capacity to form the requisite intent. RP 2473, RP 2480, RP 2481 - 2483. Ultimately, Mr. Peale tried to fuse these two somewhat inconsistent defenses by arguing that Mr. Pounds' level of intoxication precluded him from acting as an accomplice-from knowing what the others planned to do. RP 2455 – 2456, RP 2468, RP 2470, RP 2480 and RP 2483 – 2484.

In response, DPA Spencer argued that Mr. Peale had done an admirable job of attempting to confound or "cloud" the issues, but that all of the evidence supported the conclusion that Pounds shot Heazlett. RP 2487, RP 2490, RP 2494. One piece of evidence that "pointed the finger" at Mr. Pounds, as the prosecutor phrased the argument, as comparative bullet lead analysis. RP 2488, RP 2494.

C. ARGUMENT

1. Newly Discovered Evidence Makes This Petition Timely and Merits a New Trial. The Bullet Lead Testimony Was Material Because the Defense Theory Would Have Been Altered and Stronger, If the Defense Knew that Testimony Was “Junk” Science.
2. Recently Revealed Material and Exculpatory Evidence Merits a New Trial.

Introduction

Science moves inexorably forward and hypotheses or methodologies once considered sacrosanct are modified or discarded. The judicial system, with its search for the closest approximation to the “truth,” must accommodate this ever-changing scientific landscape. And, it must do so even where the result is to upset a conviction once believed to be final. That is the challenge in this case.

Aside from eyewitness testimony, some of the most believable evidence presented in criminal cases in the United States comes from the FBI crime laboratory in Quantico, Virginia. Part of its job is to test and analyze everything from ballistics to DNA for state and local prosecutors around the country, introducing scientific credibility to often murky cases. The science, called bullet lead analysis, was used by the FBI for 40 years in thousands of cases. CBLA is a process that measures the elemental composition of the lead found in one bullet and compares it to that of the lead found in another bullet. See Edward J.

Imwinkelried & William A. Tobin, *Comparative Bullet Lead Analysis (CBLA) Evidence: Valid Inference or Ipse Dixit?*, 28 OKLA. CITY U.L.REV. 43, 44-45 (2003). Pursuant to CBLA, two bullets with statistically significant similarities in their elemental composition may be declared “analytically indistinguishable,” the implication being that they were manufactured during a single process by a single manufacturer and thereafter found their way into the same box of bullets purchased by a person who, inferentially, fired both. See Imwinkelried & Tobin, *supra*, at 47; see also *Ragland v. Commonwealth*, 191 S.W.3d 569, 576 (Ky.2006).

Newly Discovered Evidence

A new trial based on newly discovered evidence is warranted when the moving party demonstrates that the evidence (1) will probably change the result of the trial; (2) was discovered since the trial; (3) could not have been discovered before trial by the exercise of due diligence; (4) is material; and (5) is not merely cumulative or impeaching. *State v. Williams*, 96 Wn.2d 215, 223, 634 P.2d 868 (1981). The absence of any one of these factors is grounds to deny a new trial. *Williams*, 96 Wn.2d at 223.

Clearly, new scientific evidence may constitute newly discovered evidence. See e.g., *State v. Halsey*, 329 N.J.Super. 553, 559, 748 A.2d 634 (App. Div.), *cert. denied*, 165 N.J. 491, 758 A.2d 650 (2000) (new scientific evidence presents a viable means by which a defendant can seek a new trial if he can now show that recently improved scientific methodology, not available at the time of trial, would

probably have changed the result). For example, it is well-known that the use of DNA testing has upset many convictions which took place before that technique was developed.

The State may argue that this new evidence would serve only to impeach the FBI analyst who testified at Pounds' trial. If the State makes this argument, *State v. Roche*, 114 Wn.App. 424, 59 P.3d 682 (2002), expressly holds otherwise:

Hoover's credibility has been totally devastated by his malfeasance. Not only did Hoover steal heroin from the crime lab, he also admitted that he regularly used heroin on the job. He repeatedly lied about his activities until he was finally confronted with the fact that he had been videotaped. Even then, he maintained that it all started when an officer asked him to purify heroin for a drug-dog training project, although he could not provide the name of the officer who allegedly made this request. Furthermore, Hoover's co-workers thought that his work seemed sloppy and even suspected, with some scientific basis to support their suspicions, that he might have been dry labbing some methamphetamine cases. These events are serious enough that a rational trier of fact could reasonably doubt Hoover's credibility regarding his testing of any alleged controlled substances, not just heroin, and regarding his preservation of the chain of custody during the relevant time period.

Id. at 437. Specifically, on the issue of whether this new information was merely impeachment, the Court held:

Moreover, the evidence of Hoover's malfeasance is more than "merely" impeaching; it is critical, with respect to Hoover's own credibility, the validity of his testing, and the chain of custody. *See State v. Savaria*, 82 Wash.App. 832, 838, 919 P.2d 1263 (1996) ("[I]mpeaching evidence can warrant a new trial if it devastates a witness's uncorroborated testimony establishing an element of the offense. In such cases the new evidence is not merely impeaching, but critical.").

In denying Roche's motion for a new trial, the court noted that the main issue at trial was whether Roche constructively possessed the substances found at his residence, not whether the substances were in fact methamphetamine. But Roche had no reason to challenge Hoover's testimony at his trial because evidence of Hoover's malfeasance had not yet come to light. As far as the defense bar knew at that time, Hoover was a respected and reputable chemist whose integrity and scientific methodology were above reproach. There can be no doubt, however, that if evidence of Hoover's theft of heroin, use of heroin at work, sloppy work habits, and the factually supportable suspicion of his fellow chemists that he was dry labbing had come to light during Roche's trial, the admissibility of the trial exhibits would have been vigorously challenged and probably the exhibits would not have been admitted into evidence at all.

Id. at 438.

Exculpatory Evidence

Under *Brady*, the State is required to disclose exculpatory and impeachment evidence that is favorable to the accused and material to guilt or punishment. *See U.S. v. Bagley*, 473 U.S. 667, 674, 676, 105 S.Ct. 3375, 87 L.Ed.2d 481 (1985); *State v. Benn*, 120 Wash.2d 631, 650, 845 P.2d 289 (1993). Evidence is material if “ ‘there is a reasonable probability that, but for counsel's unprofessional errors, the result of the proceeding would have been different.’ ” *Bagley*, 473 U.S. at 682 (quoting *Strickland v. Washington*, 466 U.S. 668, 694, 104 S.Ct. 2052, 80 L.Ed.2d 674 (1984)); *Benn*, 120 Wash.2d at 649, 845 P.2d 289. A reasonable probability is “ ‘a probability sufficient to undermine confidence in the outcome [of the trial].’ ” *Bagley*, 473 U.S. at 682 (quoting *Strickland*, 466 U.S. at 694); *see also Benn*, 120 Wash.2d at 649, 845 P.2d 289.

In *Brady*, the Supreme Court held that “the suppression by the prosecution of evidence favorable to an accused upon request violates due process where the evidence is material either to guilt or to punishment, irrespective of the good faith or bad faith of the prosecution.” *Id.* at 87. By its terms, *Brady*'s holding was limited to cases in which the defendant made a request for the suppressed evidence. However, the Supreme Court made clear in *United States v. Agurs*, 427 U.S. 97, 96 S.Ct. 2392, 49 L.Ed.2d 342 (1976), that the failure to disclose material and favorable evidence will violate due process even when the defendant makes no request for the material.

As *Bagley* makes clear, a defendant need only demonstrate a reasonable probability that “the result of the proceeding would have been *different*.” To satisfy this standard, a defendant will not always have to show a reasonable probability that he would have been exonerated if the material had been disclosed. In a case such as the present one, it is sufficient to establish a reasonable likelihood that the *degree of conviction* would have been lower. *Cf. Hill v. Lockhart*, 474 U.S. 52, 59, 106 S.Ct. 366, 371, 88 L.Ed.2d 203 (1985) (holding, in context of ineffective assistance challenge to a guilty plea, that a defendant need only show “a reasonable probability that, but for counsel's errors, he would not have pleaded guilty and would have insisted on going to trial”).

In *United States v. Brumel-Alvarez*, 991 F.2d 1452 (9th Cir.1993), the Ninth Circuit explained that “*Brady* information includes ‘material ... that bears on

the credibility of a significant witness in the case.’ ” *Id.* at 1461 (quoting *United States v. Strifler*, 851 F.2d 1197, 1201 (9th Cir.1988), *cert. denied*, 489 U.S. 1032, 109 S.Ct. 1170, 103 L.Ed.2d 228 (1989)) (ellipsis in *Brumel-Alvarez*). The test is not whether there is sufficient other evidence to support a verdict, but whether we can be confident that the jury would have returned the same verdict had the *Brady* violation not occurred. *See Lindsey v. King*, 769 F.2d 1034, 1042-43 (5th Cir.1985) (holding that the failure to disclose evidence impeaching one of the two eyewitnesses caused sufficient prejudice to undermine confidence in the outcome, even though the other witness's testimony supported the verdict by itself).

The *Brady* obligation continues beyond trial, to appeal and post-conviction cases.

The Continuing Failure to Disclose the Flaws in Bullet Lead Analysis

As early as 1991, a study was available to the FBI, but not to the public which was exculpatory. E.R. Peele, D.G. Havekost, R.C. Halberstam, R.D. Koons, C.A. Peters, and J.P. Riley, *Comparison of Bullets Using the Elemental Composition of the Lead Component*, PROCEEDINGS OF THE INT'L SYMPOSIUM ON THE FORENSIC ASPECTS OF TRACE EVIDENCE (1991). A second study was conducted by Iowa State University researchers at the request of the FBI in 2000 (“Iowa State Study”). Alicia Carriquiry, Michael Daniels, and Hal S. Stern, *Statistical Treatment of Class Evidence: Trace Element*

Concentrations in Bullet Lead (May 4, 2000) (unpublished study, Iowa State University) (on file with Ames Laboratory, Iowa State University).

Neither study was revealed to Mr. Pounds.

Under *Brady*, the duty of disclosure applies not only to evidence actually known to the trial prosecutor, but also evidence known to those acting on the Government's behalf. See *Kyles v. Whitley*, 514 U.S. 419, 437, 115 S.Ct. 1555, 131 L.Ed.2d 490 (1995) (holding that the “individual prosecutor has a duty to learn of any favorable evidence known to the others acting on the government's behalf in the case, including the police.”); accord *United States v. Pelullo*, 399 F.3d 197, 218 (3d Cir.2005) and *United States v. Chalmers*, 410 F.Supp.2d 278, 290 (S.D.N.Y.2006).

Other courts have held that certain internal studies and reports generally relevant to the reliability of evidence introduced against an accused may be material to guilt or innocence. For example, in *United States v. Wood*, the Ninth Circuit determined that Investigational New Drug applications (“INDs”) released by the Federal Drug Administration (“FDA”) “were *Brady* material, which the government had a duty to disclose....” 57 F.3d 733, 737 (9th Cir.1995). In that case, Wood had been convicted of distributing gamma hydroxybutrate and gamma hydroxybutyric acid sodium salt (collectively “GHB”) in violation of 18 U.S.C. § 371-defrauding the FDA by obstructing its function of ensuring that prescription

drugs are safe and effective and dispensed pursuant to a prescription from a practitioner licensed by law to administer such drugs. *Id.* at 735.

At trial, controversy arose over whether GHB could be considered a prescription drug, a point that turned on whether it could be deemed dangerous to humans. Subsequent to trial, Wood learned that INDs had been filed with the FDA that included “a fair amount of ... material ... [showing] ... that GHB, if properly taken by humans, was not dangerous to them.” *Id.* The appellate court concluded that those INDs would have been useful in impeaching the Government's expert's testimony on GHB's dangerousness, and accordingly remanded the case to the district court to determine whether the INDs were “material” under *Brady*. *Id.* at 738-39. The district court's determination that the INDs were not material was later overturned in an unpublished Ninth Circuit opinion. *See United States v. Wood*, 1997 WL 207973, 1997 U.S. App. LEXIS 9077 (9th Cir. Apr. 25, 1997).

Wood thus stands for the proposition that studies or reports available to an agency involved in a prosecution and useful to a defendant may be *Brady* material.

The State did not disclose the problems with CBLA until the FBI abandoned it altogether and took affirmative steps to inform prosecutors in those cases where FBI scientists had testified.

There should be no question that the evidence relied on by Pounds is newly discovered and could not have been discovered with due diligence at the time of

trial. Instead, the only anticipated argument by the State is that CBLA was not material to Pounds' conviction.

This argument, if advanced, should be rejected by this Court.

Materiality

Since the problems with CBLA were documented, a number of courts have overturned convictions and granted new trials. See *Ragland v. Commonwealth*, 191 S.W.3d 569, 580 (Ky. 2006) (“If the FBI Laboratory that produced the CBLA evidence now considers such evidence to be of insufficient reliability to justify continuing to produce it, a finding by the trial court that the evidence is both scientifically reliable and relevant would be clearly erroneous....”); *Clemons v. State*, 896 A.2d 1059, 1070, 1078 (Md. 2006) (“CBLA is not admissible under the Frye-Reed standard because it is not generally accepted within the scientific community as valid and reliable....Based on the criticism of the processes and assumptions underlying CBLA, we determine that the trial court erred in admitting expert testimony based on CBLA because of the lack of general acceptance of the process in the scientific community.”); *State v. Behn*, 868 A.2d 329, 331 (N.J. Super. Ct. App. Div. 2005) (finding the technique was “based on erroneous scientific foundations”). But see *United States v. Davis*, 406 F.3d 505, 509 (8th Cir. 2005) (“Davis's trial counsel cannot be said to be ineffective for failing to challenge the FBI's methodology on a basis that was not advanced by the scientific community at the time of trial.”); *Commonwealth v. Fisher*, 870 A.2d 864, 871

(Pa. 2005) (“The CBLA evidence, at best, established a possible connection between Appellant and the bullets recovered from the victim's body.”).

There can be little doubt that the revelation that a piece of the scientific case against Mr. Pounds was unscientific is exculpatory. The State will likely ask this Court to examine that piece of evidence in total isolation and argue that it was not material enough to merit a new trial now. The State will likely argue that the evidence was not relied on heavily by the State in order to obtain Pounds’ conviction.

Like many pieces of what were believed to be scientific evidence, the defense viewed the CBLA as unimpeachable—a fact beyond dispute. Thus, the defense theory of the case began with that fact. If the defense had know that the presumed unimpeachable was really “junk,” the defense theory would have been different.

In *United States v. Kennedy*, 890 F.2d 1056 (9th Cir.1989), *cert. denied*, 494 U.S. 1008, 110 S.Ct. 1308, 108 L.Ed.2d 484 (1990), the court stated that “[t]o be material under *Brady*, undisclosed information *or evidence acquired through that information* must be admissible.” *Id.* at 1059 (emphasis added). The *Kennedy* court noted that “in determining the materiality of undisclosed information, a reviewing court may consider ‘any adverse effect that the prosecutor’s failure to respond might have had *on the preparation or presentation* of the defendant’s case.’ ” *Id.* (quoting *Bagley*, 473 U.S. at 683, 105 S.Ct. at 3384) (emphasis added).

Trial counsel has submitted a declaration stating, in part:

3. Recently, I was contacted by current counsel for Mr. Pounds. Mr. Ellis provided me with a number of materials which he asked me to review. These documents included portions of the trial transcripts, as well as a letter from the FBI indicating that the type of comparative bullet lead testimony that was given in Mr. Pounds' case "exceeds the limits of the science and cannot be supported by the FBI."

4. After reviewing these materials and thinking about my representation of Mr. Pounds, it is my opinion, if I had known that the opinion of FBI Special Agent Roger Asbury was not based on sound science, it would have altered my case preparation and trial presentation.

5. My primary focus in defending Mr. Pounds was to attack the State's claim that he shot and killed the victim. The State's evidence against Mr. Pounds was largely based on informant-witnesses, whose credibility was very much at issue especially considering their motives to lie.

6. However, the FBI's comparative bullet lead evidence presented a significant obstacle.

7. In light of this evidence, I decided to make alternative arguments at trial—namely, that Pounds did not shoot and kill the victim, but, if he did, he did not have the requisite intent. I was worried that making this second argument tended to undercut our primary defense. However, I did not think I had much choice in light of the expert opinion on bullet lead.

8. If I had known that the bullet lead analysis was not supported by the science, I would not have made the "alternative" argument. Instead, I would have focused exclusively on attacking the evidence that Mr. Pounds shot and killed the victim.

See *Appendix A*. The State may well contest this declaration. If they do so, they are likewise required to support their arguments with competent, admissible evidence. Further, if State satisfies its burden of production, then this Court should remand this case to the trial court for an evidentiary hearing. RAP 16.11.

If the State fails to satisfy its burden, then this Court should grant Mr. Pounds' PRP and direct that the State retry or release him.

D. CONCLUSION

Based on the above, this Court should call for a response from the State; remand for an evidentiary hearing if any material facts are in dispute; and reverse and remand for a new trial.

DATED this 10th day of June, 2011.

/s/ Jeffrey E. Ellis
Jeffrey E. Ellis #17139
Attorney for Mr. Pounds
Law Office of Alsept & Ellis
621 SW Morrison St., Ste 1025
Portland, OR 97205
(206) 218-7076 (ph)
JeffreyErwinEllis@gmail.com

DECLARATION OF WALTER PEALE

I, Walter O. Peale, declare:

1. I was trial counsel for Leslie Pounds.
2. I have been an attorney since 1977. During my professional career, I have emphasized criminal defense with a concentration on major felony crimes. I have taken hundreds of cases to jury trial. Leslie Allen Pounds was not my first homicide case. My strategic decisions were made after careful consideration of the facts and after consultation with my client, with other lawyers in my office, and my investigator.
3. Mr. Jeff Ellis asked me to review a part of the trial transcript and a letter from the FBI. Mr. Ellis is the present counsel for Mr. Pounds. In particular I was asked to review the trial testimony and cross examination of FBI Special Agent Roger Asbury in light of the language in the FBI letter: the type of comparative bullet lead testimony given in Mr. Pounds' case "exceeds the limits of the science and cannot be supported by the FBI."
4. After reviewing the FBI letter, the partial trial transcript, and recalling my representation of Mr. Pounds, it is my conclusion that had I known the opinion of Agent Asbury was not based on sound science, it would have

altered my case preparation and defense presentation. Had I known the FBI did not support the opinion of Agent Asbury I could have prevented his evidence. A successful challenge would have significantly altered and strengthened my defense. Without his evidence I am confident a different result would have occurred at trial.

5. My primary focus in defending Mr. Pounds was to attack the State's claim that he shot and killed the victim. The State's evidence against Mr. Pounds was largely based on informant-witnesses, whose credibility was very much at issue especially considering their motives to lie. The death shot could have been fired by anyone who was present.

6. However, the FBI's comparative bullet lead evidence presented a significant obstacle.

7. In light of Agent Asbury's evidence, I made alternative arguments at trial—namely, that Pounds did not shoot and kill the victim, but, if he did, he did not have the requisite intent to kill. I was worried that making this second argument tended to undercut our primary defense. However, I did not think I had much choice in light of the expert opinion on bullet lead.

8. If I had known that the bullet lead analysis was not supported by the FBI, I would not have made the "alternative" argument. Instead, I would have focused exclusively on attacking the evidence that Mr. Pounds shot and

killed the victim. I conclude if the State had known the evidence was not credible it would not have been offered at the trial of Mr. Pounds.

I DECLARE UNDER PENALTY OF PERJURY UNDER THE LAWS OF THE STATE OF WASHINGTON THAT THE FOREGOING IS TRUE AND CORRECT TO THE BEST OF MY INFORMATION AND BELIEF.


Walter Peale

WSB9 7889

May 2, 2011 Seattle, WA
Date and Place



U.S. Department of Justice

Federal Bureau of Investigation

In Reply, Please refer to

File No

May 15, 2009

Tricia Stemler
Snohomish Co. Prosecutor's Office
3000 Rockefeller Ave
M/S 504
Everett, WA 98201

Re: Case Name: Leslie A. Pounds; 83-1-00599-4
FBI File Number: 95-257507

Dear Sir or Madam:

This letter follows up on our previous communication regarding bullet lead analysis conducted by the FBI Laboratory. Thank you for providing the information requested from the above-referenced case.

A review of the testimony provided by an FBI Laboratory examiner on the subject of compositional analysis of bullet lead was conducted on the transcript that you provided. The goal of the review was to determine if there was a suggestion by the examiner that a bullet fragment or shot pellet was linked to a single box of ammunition without clarification that there would be a large number of other bullets or boxes of bullets that could also match those fragments or shot pellet. Science does not support the statement or inference that bullets, shot pellets, or bullet fragments can be linked to a particular box of bullets. Further, any testimony stating bullets came from the same source of lead is potentially misleading without additional information regarding approximate numbers of other "analytically indistinguishable" bullets that also originated from that same source. Finally, any testimony regarding the geographical distribution of analytically indistinguishable bullets exceeds the data currently available.

After reviewing the testimony of the FBI's examiner, it is the opinion of the Federal Bureau of Investigation Laboratory that the examiner did state or imply that the evidentiary specimen(s) could be associated to a single box of ammunition. This type of testimony exceeds the limits of the science and cannot be supported by the FBI.

Your office is encouraged to consult appellate specialists in your jurisdiction to determine whether you have any discovery obligations with respect to the finding stated above. As directed by the Department of Justice, we are notifying the Chief Judge of the court in which this case was tried of the results of our review by copying him or her on this letter.

Comparative Bullet Lead Analysis Review Process
May 15, 2009

Additionally, you should be aware that the FBI is cooperating with the Innocence Project. *The Innocence Project is interested in determining whether improper bullet lead analysis testimony was material to the conviction of any defendant, and, if so, to ensure appropriate remedial actions are taken.* In order to fully assist them in their evaluation, the FBI will provide the Innocence Project information from our files, including a copy of the FBI expert's trial testimony in this case and our assessment of that testimony.

Further questions regarding our review of your case or the general issue of bullet lead examinations may be addressed to Marc LeBeau at: FBI Laboratory Division, 2501 Investigation Parkway, Room 4220, Quantico, VA 22135 (703-632-7408). General legal questions should be directed to Assistant General Counsel James Landon, Office of the General Counsel, FBI Headquarters, Washington, DC 20535 (202-324-1724).

Sincerely,



D. Christian Hassell, Ph.D.
Director
FBI Laboratory

cc: Larry E. McKeeman
Snohomish County Superior Court
Snohomish County Courthouse
3000 Rockefeller Ave M/S 502
Everett, WA 98201

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Article

***53 DAUBERT AND FORENSIC SCIENCE: THE PITFALLS OF LAW ENFORCEMENT CONTROL OF SCIENTIFIC RESEARCH**

Paul C. Giannelli [FN1]

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In 2009, the National Academy of Sciences (NAS) published a landmark report on forensic science: *Strengthening Forensic Science in the United States: A Path Forward*. The Report represents one of the most important developments in forensic science since the establishment of the crime laboratory in the 1920s. Within months, Justice Scalia cited the Report in *Commonwealth v. Melendez-Diaz*, noting that “[s]erious deficiencies have been found in the forensic evidence used in criminal trials” and “[f]orensic evidence is not uniquely immune from the risk of manipulation.” After two years of studying fingerprints, handwriting, ballistics, and other common forensic techniques, the Academy concluded that “some forensic science disciplines are supported by little rigorous systematic research to validate the discipline’s basic premises and techniques.” Indeed, “only nuclear DNA analysis has been rigorously shown to have the capacity to consistently, and with a high degree of certainty, demonstrate a connection between an evidentiary sample and a specific individual or source.”

The NAS Report’s centerpiece is a proposal to establish an independent federal agency, the National Institute of Forensic Science, to control funding and research in the field. This proposal, which is now before Congress, wrests control of forensic science from law enforcement and was attacked by government agencies before the Report was even released. Although the Report made clear that the Department of Justice, through the FBI Crime Laboratory and National Institute of Justice, had failed in its obligation to improve forensic science, the Report did not provide details of this failure. This Article supplies those details, documenting how government agencies manipulated science at the expense of both science and justice. As the Report notes, basic research in the forensic sciences is weak. Yet, the only*54 agency currently capable of funding that research, the Department of Justice, has hindered efforts to conduct independent scientific studies.

“Forensic evidence is not uniquely immune from the risk of manipulation.”— Justice Scalia (2009) [FN1]

I. Introduction

The National Academy of Sciences (NAS) Report on forensic science provides a searing critique of the field. [FN2] Released in 2009, the Report’s findings are disturbing: “Among existing forensic methods, only nuclear DNA analysis has been rigorously shown to have the capacity to consistently, and with a high degree of certainty, demonstrate a connection between an evidentiary sample and a specific individual or source.” [FN3] Moreover, “some forensic science disciplines are supported by little rigorous systematic research to validate the discipline’s basic premises and techniques. There is no evident reason why such research cannot be conducted.” [FN4]

Coming after a congressionally-funded two-year study, which included a review of fingerprint examinations,

handwriting comparisons, firearm identifications (ballistics), and other common forensic techniques, these findings by one of the nation's most prestigious scientific organizations are riveting. After all, fingerprints have been admitted as evidence since 1911. [FN5] Soon afterwards handwriting [FN6] and ballistics [FN7] were *55 judicially sanctioned as well. Yet, the NAS Report found that (1): "Sufficient studies [on firearms identification] have not been done to understand the reliability and repeatability of the methods," [FN8] (2) "[t]he scientific basis for handwriting comparisons needs to be strengthened," [FN9] (3) research is needed "[t]o properly underpin the process of friction ridge [fingerprint] identification," [FN10] and (4) "testimony linking microscopic hair analysis with particular defendants is highly unreliable." [FN11] These problems are exacerbated by "exaggerated" testimony, [FN12] such as claims of perfect accuracy, [FN13] infallibility, [FN14] and zero error rates. [FN15] The lack of standards in examining evidence was also considered troubling: "Often there are no standard protocols governing forensic practice in a given discipline. And, even when protocols are in place . . . , they often are vague and not enforced in any meaningful way." [FN16] In addition, a technique's limitations need to be acknowledged in both court testimony and laboratory reports. [FN17]

The Report's capstone is a proposal to create an independent federal agency, the National Institute of Forensic Science (NIFS), to control funding and research in the field. [FN18] The NAS Committee "strongly believe[d] that the greatest hope for success in [reform] will come with the creation of the [NIFS] to oversee and direct the forensic science community. The remaining recommendations in th[e] report are crucially tied to the creation of NIFS." [FN19] Among other tasks, the NIFS would be responsible*56 for: (1) "establishing and enforcing best practices for forensic science professionals and laboratories"; (2) setting standards for the mandatory accreditation of crime laboratories and the mandatory certification of examiners; (3) "promoting scholarly, competitive peer-reviewed research and technical development" in the forensic sciences; and (4) "developing a strategy to improve forensic science research." [FN20] This proposal wrests control of forensic science from law enforcement, a controversial but needed reform. A related recommendation urges the removal of crime laboratories from the administrative control of the police. [FN21]

While the NAS Report made clear that the Department of Justice (DOJ), through the FBI Crime Laboratory and National Institute of Justice (NIJ), had failed in its obligation to improve forensic science—thus creating the need for a new independent agency—it did not provide evidence to support this critical judgment. The Report did state that forensic evidence should be equally available to the police, prosecutors, and defense and that there was the "potential" for conflicts of interest between the needs of law enforcement and those of forensic science. [FN22] But these reasons by themselves would not justify an entirely new entity. [FN23] The Committee also found that "the research funding strategies of DOJ have not adequately served the broad needs of the forensic science community." [FN24] This concern, however, could also have been addressed without the creation of the NIFS.

The Report came closer to the mark when it determined that some federal entities are "too wedded" to the status quo and "have failed to pursue a rigorous research agenda to confirm the evidentiary reliability of methodologies used in a number of forensic science disciplines." [FN25] As a result, these "agencies are not good candidates to oversee the overhaul of the forensic science community." [FN26] There is little question that the Committee was referring to the NIJ and the FBI Laboratory. The Report noted that, although both had provided "modest leadership" in forensic science, "neither entity has recognized, let alone articulated, a need for change or a vision for achieving it." [FN27] Consequently, "advancing *57 science in the forensic science enterprise is not likely to be achieved within the confines of DOJ." [FN28] These are conclusions, however. The Committee gave no explanation of how it reached them. [FN29]

This Article argues that there is more than adequate support for the Report's conclusions that meaningful reform requires an independent agency. Scientific values are often antithetical to law enforcement values—or at least frequently perceived to be so by prosecutors and police. In particular, the notion of transparency has repeatedly been trumped by an adversarial process that favors trial by ambush. As Sheila Jasanoff has reminded us: "Science and secrecy do not sit comfortably together." [FN30] The DOJ, the FBI Crime Laboratory, and some prosecutors have attempted to shape science by controlling the research agenda, hiding unwelcomed test results, attacking legitimate

studies that were considered unfavorable, harassing scientists who disagreed with them, and “spinning” these issues in the press. Indeed, the NIJ attempted to subvert the recent NAS Report before it was even released. [FN31] This conduct is troubling precisely because it involves the government. Paradoxically, these are the very agencies of government that are entrusted to be “ministers of justice.” [FN32] The problem is exacerbated by the fact that the DOJ and FBI Laboratory control the funding of research in forensic science.

An understanding of the NAS Report requires some appreciation of the developments that led Congress to authorize the NAS study in the first place, a subject addressed in Part II of this Article. Parts III through V examine law enforcement manipulation of science in three areas—DNA profiling, fingerprinting, and **comparative analysis of bullet lead**. [FN33] *58 Part VI discusses NIJ efforts to undermine the NAS Report. This Article concludes by urging Congress to establish the NIFS, as recommended by the NAS.

II. The Paradigm Shift in Forensic Science

The advent of DNA profiling in the late 1980s, [FN34] followed by the U.S. Supreme Court's decision in *Daubert v. Merrell Dow Pharmaceuticals, Inc.* in 1993, [FN35] drastically altered the legal landscape for scientific evidence—triggering a “paradigm shift” in the view of some commentators. [FN36] DNA evidence became the “gold standard” in forensic science, [FN37] and *Daubert* revolutionized how courts scrutinized expert testimony. [FN38]

A. The Impact of DNA Profiling

The battles over the admissibility of DNA evidence [FN39] led to two studies by the NAS, which issued reports noting the importance of certain practices. For example, “[n]o laboratory should let its results with a new DNA typing method be used in court, unless it has undergone . . . proficiency testing via blind trials.” [FN40] This requirement was unheard of in forensic science, and commentators did not wait long to point out the possible far-reaching implications that DNA profiling might have for other forensic techniques. Citing DNA profiling, Professors Saks and Koehler wrote in 1991 that

*59 [F]orensic scientists, like scientists in all other fields, should subject their claims to methodologically rigorous empirical tests. The results of these tests should be published and debated. Until such steps are taken, the strong claims of forensic scientists must be regarded with far more caution than they traditionally have been. [FN41]

In addition to establishing a new gold standard, DNA evidence had two other important consequences. First, it focused attention on the lack of regulation of crime laboratories. In 1989, Eric Lander, a prominent molecular biologist who became enmeshed in the early DNA admissibility disputes, wrote: “At present, forensic science is virtually unregulated—with the paradoxical result that clinical laboratories must meet higher standards to be allowed to diagnose strep throat than forensic labs must meet to put a defendant on death row.” [FN42]

Second, the use of DNA profiling to exonerate innocent convicts led to a reexamination of the types of evidence admitted to secure their convictions. [FN43] Some studies indicated that, after eyewitness testimony, forensic identification evidence was the most common type of testimony that jurors relied on in returning erroneous verdicts. [FN44] Flawed forensic analyses played a significant role in many of these miscarriages of justice. [FN45] For example, although bite mark evidence had been admitted at *60 trial for over forty years, DNA evidence exonerated convicts, some on death row, whose convictions were based on bite mark testimony. [FN46] Similarly, microscopic hair analysis was often used—and misused—in the wrongful conviction cases. [FN47]

B. The Impact of *Daubert*

The impact of DNA profiling was reinforced by the *Daubert* decision, which enunciated a new reliability test for expert testimony. *Daubert* listed several factors that trial judges should consider in assessing reliability. The first and

foremost Daubert factor is testability. [FN48] Citing scientific authorities, the Supreme Court noted that a hallmark of science is empirical testing. [FN49] The other factors listed by the Court are generally supplementary. For example, the second factor, peer review and publication, [FN50] is a means to verify the results of the testing mentioned in the first factor, and in turn, verification can lead to general acceptance of the technique within the scientific community. [FN51] Similarly, another factor, an error rate, [FN52] is derived from testing.

The first significant post-Daubert admissibility challenge occurred in 1995 and involved handwriting analysis. In *United States v. Starzecpyzel*, [FN53] the district court concluded that “forensic document examination, despite the existence of a certification program, professional journals and other trappings of science, cannot, after Daubert, be regarded as ‘scientific’ . . . knowledge.” [FN54] *Starzecpyzel* soon prompted more challenges to handwriting evidence, attacks that further exposed the lack of empirical validation in the field. [FN55] These challenges had some success—with several courts restricting the reach of a questioned document examiner’s opinion, permitting expert testimony about similarities and dissimilarities between exemplars but not an ultimate conclusion that the defendant was the author (“common authorship” opinion) of the questioned document. [FN56] In a few cases, specific types of evidence were excluded. [FN57] More importantly, the handwriting cases opened the door to attacks on other techniques. Indeed, some courts viewed Daubert and its progeny as inviting a “reexamination even of ‘generally accepted’ venerable, technical fields.” [FN58]

If *Starzecpyzel* unsettled document examiners, *United States v. Llera Plaza* [FN59] “sent shock waves through the community of fingerprint analysts.”*62 [FN60] In that case, Judge Pollak ruled that fingerprint experts would not be permitted to testify that two sets of prints “matched”—that is, a positive identification to the exclusion of all other persons. [FN61] This was the first time in nearly one hundred years that such a decision had been rendered. [FN62] On rehearing, however, Judge Pollak reversed himself, [FN63] and later cases would continue to uphold the admissibility of fingerprint evidence. [FN64] Yet the spotlight could not be switched off. [FN65] News reports, [FN66] mainstream publications, [FN67] scientific journals, [FN68] and television shows covered the case. [FN69] A spate of legal articles followed, [FN70] with many commentators believing that *Llera Plaza I* was more faithful to Daubert than *Llera Plaza II*. [FN71]

*63 *Llera Plaza* was soon eclipsed by a more sensational event—the FBI’s misidentification of Brandon Mayfield as the source of the crime scene prints in the terrorist train bombing in Madrid on March 11, 2004. [FN72] More than any other event, the Mayfield affair exposed the myth of fingerprint infallibility. [FN73] The misidentification resulted in investigations by the Bureau [FN74] and the Inspector General of the DOJ, [FN75] which in turn triggered a more extensive review of the scientific basis of fingerprint identification by the FBI. [FN76]

Once Daubert attacks on the admissibility of handwriting and fingerprint evidence had been made, it was inevitable that firearms identifications would also be challenged. The initial attacks failed. [FN77] However, in *United States v. Green*, [FN78] the court recognized the shortcomings in this field. The expert testified that a match could be made “to the exclusion of every other firearm in the world”; according to the court, “[t]hat conclusion . . . is extraordinary, particularly given [the expert’s] data and methods.” [FN79] Despite “serious reservations,” the judge felt “compelled” to *64 allow the testimony based on precedent. [FN80] Significantly, however, the court limited the testimony as it had previously done in handwriting cases. [FN81] The expert could only describe and explain the ways in which the cartridge cases were similar, but not that they came from a specific weapon “to the exclusion of every other firearm in the world”; in the court’s view, “[t]hat conclusion . . . stretches well beyond [the expert’s] data and methodology.” [FN82] Finally, the court issued a caution: “The more courts admit this type of toolmark evidence without requiring documentation, proficiency testing, or evidence of reliability, the more sloppy practices will endure; we should require more.” [FN83] In sum, the fallout from the Daubert challenges, like DNA profiling, had a significant impact on forensic science.

C. Response of Scientific Community

By this time, sectors of the scientific community were becoming interested—and alarmed—about how science

was being used in criminal cases. In 2002, a stunning editorial appeared in *Science*, one of the country's top scientific journals. The title alone is remarkable, "Forensic Science: Oxymoron?" [FN84] Written by the editor-in-chief, the editorial discussed the cancellation of a NAS project designed to examine various forensic science techniques, including fingerprinting, because the Departments of Justice and Defense insisted on a right of review that the Academy, as a scientific institution, found objectionable. [FN85] The NAS relies on the government and private foundations for funding, which creates a "Catch-22" dynamic: the organization with the expertise to commission an independent study is dependent for financial support upon the federal agencies that want to control the research.

*65 Next, a series of articles appeared in *Issues in Science and Technology*, the official publication of the NAS. One article included the following observation:

The increased use of DNA analysis, which has undergone extensive validation, has thrown into relief the less firmly credentialed status of other forensic science identification techniques (fingerprints, fiber analysis, hair analysis, ballistics, bite marks, and tool marks). These have not undergone the type of extensive testing and verification that is the hallmark of science elsewhere. [FN86]

Another article criticized how research has been controlled by the prosecution, arguing that "we have a growing body of unreliable research funded by law enforcement agencies with a strong interest in promoting the validity of these techniques." [FN87] Other authors discussed deficiencies in fingerprint analysis [FN88] and crime laboratory regulation. [FN89]

In 2005, Congress intervened, bypassing the DOJ and appropriating \$1,500,000 to the NAS to study forensic science. As previously discussed, the NAS Report's central recommendation is the establishment of a new independent agency, NIFS. [FN90] Although this recommendation is emphatic, it is not well supported. The next Parts provide the evidence for this recommendation, which is critical for meaningful reform.

III. DNA Profiling

Forensic DNA analysis was first introduced in this country in the late 1980s through the efforts of private companies, principally Lifecodes and Cellmark. [FN91] The introduction of DNA evidence went smoothly in the initial cases, but then a successful challenge to admissibility was mounted in *People v. Castro*. [FN92] After a fourteen-week evidentiary hearing*66 with a 5000-page transcript, the court wrote: "In a piercing attack upon each molecule of evidence presented, the defense was successful in demonstrating to this court that the testing laboratory failed in its responsibility to perform the accepted scientific techniques and experiments in several major respects." [FN93] In an unusual occurrence, the prosecution and defense experts met without the attorneys and issued a joint statement, including the following:

[T]he DNA data in this case are not scientifically reliable enough to support the assertion that the samples . . . do or do not match. If these data were submitted to a peer-reviewed journal in support of a conclusion, they would not be accepted. Further experimentation would be required. [FN94]

Another problem, which would only be revealed years later, lurked beneath the surface in *Castro*. Nearly two decades after his participation as a prosecution witness in *Castro*, Richard Roberts, a Noble Laureate, stated in an interview that "it never occurred to him to ask if [the prosecutors] were withholding any data . . . [he] assumed they were showing [him] all they had." [FN95] But they were not.

It did not take the FBI Laboratory, the premier forensic facility in this country, long to appreciate the significance of DNA profiling, and the Bureau soon began work to bring its own DNA unit online. Indeed, after *Castro*, the FBI Laboratory would achieve hegemony over DNA profiling. The laboratory, however, would withhold data from the general scientific community, selectively share information with scientists it approved, and underwrite their research. Moreover, prosecutors would attack opposing experts outside the courtroom.

A. *United States v. Yee*

Castro was only the opening volley in what came to be known as the DNA admissibility wars, [FN96] sparking a debate that found its way into the popular press.

*67 In response to several critical articles on forensic DNA analysis, John Hicks, Director of the FBI Crime Laboratory at the time, wrote a letter to the *New York Times*, defending the Bureau's DNA program:

The procedures employed in these tests have been carefully defined, based on extensive studies. Our procedures and test results have passed muster when subjected to close scrutiny in the scientific community and the courts. The F.B.I. has encouraged wide review of the forensic use of DNA technology through sponsorship of technical seminars and international symposiums and support to studies conducted by the Office of Technology Assessment and the National Academy of Sciences. [FN97]

This letter was published on February 21, 1990. Yet the day before, in an Ohio courtroom, federal prosecutors—at the FBI Laboratory's behest—opposed turning over data concerning the FBI's matching criteria, environmental insult studies, population data, and proficiency testing. The case, *United States v. Yee*, [FN98] involved the first major challenge to the Bureau's DNA protocols. According to the presiding magistrate, the need for discovery was underscored by the lack of “extensive independent scientific assessment and replication of the reliability of the procedures that have been developed by the F.B.I.” [FN99] In their efforts to withhold this information, the prosecutors offered a technical (and unpersuasive) argument—that these materials were not scientific “reports” within the meaning of the federal discovery rule and therefore were not subject to disclosure. [FN100] Significantly, they did not argue that this information was irrelevant or that it would not help the defense prepare for trial. In the end, the magistrate rejected the prosecution's argument. [FN101]

When *Yee* was finally decided, the prosecution won; expert testimony based on the FBI's protocols was deemed admissible. Nevertheless, a number of disquieting comments appeared in the opinion. At one point, for example, the magistrate wrote: “[T]he F.B.I. program of [DNA] proficiency testing has serious deficiencies, even without consideration of *68 the troubling hint in the record of an impulse at one point to destroy some of the small amount of test data that had been accumulated earlier.” [FN102] There was more than a “hint” in the record: “Internal memoranda obtained through court-ordered discovery from the FBI show that the agency contemplated destroying its own scientific data concerning the performance of its DNA test in proficiency trials rather than turn the data over to defense lawyers.” [FN103] In a later passage, the magistrate commented: “I do not either disregard or discount the accuracy of many of the criticisms about the remarkably poor quality of the F.B.I.'s work and infidelity to important scientific principles.” [FN104]

B. The Science Affair

Dr. Richard C. Lewontin of Harvard University and Dr. Daniel Hartl, then of Washington University, “two of the leading lights of population genetics,” [FN105] testified for the defense in *Yee*. The prosecution had its own prominent experts, including Dr. Thomas Caskey of Baylor College of Medicine and Dr. Kenneth K. Kidd of Yale University. After the *Yee* admissibility hearing, Lewontin and Hartl submitted a paper to *Science*, which was accepted in accordance with *Science*'s peer-review process. Although Lewontin and Hartl did not question the underlying science, they wrote that the estimates of the probability of a matching DNA profile “as currently calculated, are unjustified and generally unreliable.” [FN106]

Surprisingly, the editors of *Science* changed the normal practice of publishing rebuttals in later issues and instead actively sought out a rebuttal article for the same issue. [FN107] The events proceeded as follows:

In mid-October Caskey and Kidd [the prosecution experts in *Yee*], who had both gotten hold of the paper, cornered one of *Science*'s editors at a genetics meeting and urged her not to publish it without a rebuttal.

Science editor Daniel Koshland agreed, commissioning a rebuttal by Kidd and Ranajit Chakraborty of the University of Texas, which was published in the same issue. Koshland also called Lewontin a few days after the genetics meeting, asking *69 for revisions in the [previously peer-reviewed and accepted] paper, which was already in galleys. [FN108]

Not only was the rebuttal article published in the same issue, [FN109] it appeared before the Lewontin and Hartl piece. Lewontin and Hartl accused Koshland of “caving into political pressure by commissioning the Chakraborty-Kidd rebuttal.” [FN110] Although some scientists commended Koshland for his “objective approach,” [FN111] others were shocked: “I am appalled It seems to me inconceivable that scientists would attempt to suppress publication of a paper because they disagreed with its conclusions, a paper which apparently had gone through what one assumes was a normal and stringent review process” [FN112]

In addition, James Wooley, one of the federal prosecutors in Yee, “lobbied” Hartl to withdraw the Science paper on the ground that the article was “ill-conceived.” [FN113] Although Wooley described the conversation as an “amiable chat,” Hartl, on the other hand, said it was a “chilling experience in which Wooley attempted to intimidate him.” [FN114]

*70 C. The Journal of Human Genetics Affair

Yee altered the landscape of the admissibility battles. The initial skirmishes over laboratory protocols had now metamorphosed into fights over statistical interpretation and population genetics. Accordingly, defense experts needed access to the underlying population data. [FN115] As it had done in Yee, however, the FBI balked. As one court noted: “Alt [the defendant] argues the FBI DNA test results are inadmissible because the FBI does not allow members of the scientific community general access to its data bases. . . . We are troubled by Alt’s allegations of denial of access to the FBI data bases.” [FN116] Eventually, one court ordered disclosure. The defense expert, Seymour Geisser, a professor of statistics at the University of Minnesota, explained that

the form in which databases were surrendered by the FBI was unusable for a proper analysis by the defense. However, the material was supplied, in the form requested, to one of the prosecution experts. Hearing my complaint, this expert generously sent me an appropriate diskette, to the chagrin of the FBI. [FN117]

Geisser’s travails as a defense witness were only beginning. In November 1991, he submitted a paper on the forensic use of DNA statistics to the American Journal of Human Genetics (Journal), which, in turn, sent the article out for peer review as Geisser was preparing to testify. On January 15, 1992, a prosecutor demanded discovery (by fax) of any article Geisser had written about DNA, along with any peer-review comments. [FN118] Fifteen minutes later Geisser received the peer-review comments by fax, two of which raised serious questions about his paper. Geisser believed the reviews were leaked to the prosecutor before he had even seen them. [FN119]

*71 One of the anonymous peer reviewers, who strongly recommended against publication, was Dr. Ranajit Chakraborty. Recall that he had coauthored the rebuttal article in Science and had been aligned with the prosecution in court cases. [FN120] Geisser questioned his participation in the review process:

Both [Chakraborty and the second referee, Dr. Bruce Weir] have frequently submitted reports and testified for the prosecution when FBI DNA profiles were at issue. I have testified for the defense in some of these cases. They have collaborated with FBI forensic workers, gained access to their data, and have published it. Certainly they should have recused themselves from serving as referees, or at the very least informed the editor of their situation. [FN121]

Chakraborty had also received a grant from the NIJ, the agency in the DOJ that funds forensic science research. [FN122] His proposal stated that he expected “to generate publications and make presentations at national meetings that will lend credibility to the FBI’s statistical methods.” [FN123] This suggests that the results were foreordained. James Kearney, the head of Forensic Science Research at the FBI Laboratory, sat on the panel that awarded the grant. [FN124]

Next, the Journal asked Geisser to obtain permission from the FBI to use its original data rather than data submitted by the Bureau at trial. Geisser complied, requesting permission from Dr. Bruce Budowle, the top FBI DNA scientist. The FBI informed Geisser that (1) the Bureau had made commitments earlier to other scientists (Chakraborty, Devlin, Risch, and Weir) and his study must not conflict with their projects, (2) the FBI data could be used only in a joint collaboration with Budowle, (3) the use of the data would be restricted to this one paper, and (4) all authors must agree to the entire contents of a final manuscript prior to submission to a journal. [FN125] Geisser concluded that

*72 an independent study under such provisions would be totally compromised, if not impossible. . . . By the way, Chakraborty, Devlin, Risch and Weir have all published articles based on the FBI databases without Budowle as a co-author. . . .

Recently, I analyzed Cellmark databases for a court case in Ann Arbor, Michigan. At the insistence of Cellmark, the prosecutor requested that the judge rule that I not be allowed to submit my analysis of their data for publication. So much for open science! [FN126]

Controlling scientific research in this manner is troublesome. In other fields, researchers have noted a “funding effect.” For example, “[t]he best predictor of the conclusions in published reviews assessing the health impacts of passive smoking . . . is whether they are written by authors affiliated with the tobacco industry.” [FN127] In short, researchers funded by tobacco companies found no passive smoking effect. The problem is not limited to tobacco research. An exhaustive review of 1140 biomedical studies found that “industry-sponsored studies were significantly more likely to reach conclusions that were favorable to the sponsor than were nonindustry studies.” [FN128] There is little reason to believe that forensic science research would not be subject to a “funding effect.”

D. Spinning the National Academy of Sciences DNA Report

The DNA controversy next moved to Washington, D.C., with the FBI requesting the NAS to appoint a committee to investigate the forensic use of DNA evidence. [FN129] In violation of the Academy's rules, someone leaked a confidential draft of the Committee's report to John Hicks, the FBI Laboratory Director. [FN130] Apparently undisturbed by this breach of confidentiality, Hicks wrote to the NAS criticizing the draft. [FN131] Once again, law enforcement advocates had penetrated the halls of science.

The specter of conflict of interest also surfaced at this point. [FN132] Dr. Caskey, the prosecution witness in Yee, was pressured to resign from the *73 NAS Committee because of his financial interest in a new type of DNA testing, Short Tandem Repeats, which is now the current protocol. [FN133]

E. Harassing Scientists

In civil litigation, harassment of scientists is one way to influence their behavior. One tactic involves the misuse of the subpoena power:

Burdening a scientist with unreasonable document requests does nothing to advance peer scrutiny of the research. . . . [S]uch requests effectively undercut scientific freedom by overwhelming scientists with sanctions-backed demands for documentation and, in some cases, by intimidating scientists with the threat of further legal proceedings after they produce the documents. [FN134]

State v. DeMarco [FN135] illustrates a variation of this tactic. In that case, the prosecutor issued a subpoena for 234 reports prepared in unrelated cases by the defense expert, Dr. Edward Blake. Blake, a prominent DNA expert who had consulted with both prosecutors and defense attorneys, objected. [FN136] The subpoena raised significant issues concerning the attorney-client privilege and the Sixth Amendment right to effective assistance of counsel. A New Jersey appellate court ruled that the prosecution may not compel discovery of DNA reports prepared by the defendant's expert witness for other clients in unrelated cases and issued a protective order: “Dr. Blake's reports con-

tain private and critical information which should be shielded from undue public exposure. More-over, litigators, public and private, should have access to the assistance of retained experts with a minimum of risk that their reports . . . will surface in unrelated litigation.” [FN137]

Harassment is one thing, intimidation is quite another. As the DNA wars raged on, prosecutors (and defense attorneys) formed tight knit groups to engage the legal battles. Some prosecutors closely *74 associated with the FBI lab, however, went further. [FN138] After Professor Laurence Mueller, of the University of California at Irvine, began appearing as a defense expert, a prosecutor, Rockne Harmon, began stalking him—sending letters to his department chair and the university chancellor. [FN139] According to an article in *Science*: “Harmon has dogged Mueller’s every move, scrutinizing his testimony in each case and writing him letters when he thinks his science is wrong or his ethics questionable. Indeed, Mueller seems to have almost become an obsession for Harmon.” [FN140] Mueller viewed this tactic as an attempt to keep him from testifying. Similarly, another defense expert, Professor Simon Ford, a British citizen, felt intimidated by a prosecutor’s threat of loss of his immigration status. [FN141]

Perhaps the most disturbing episode was the perjury indictment of molecular biologist Randall Libby, a defense expert, based on an affidavit he submitted in a murder case. The prosecutor faxed the indictment around the country, thereby effectively precluding Libby’s participation as a defense expert in other cases. The charges seemed dubious. [FN142] and Libby, along with a defense attorney, was eventually acquitted in a bench trial. Libby then demanded that the prosecutor notify those he had faxed of the acquittal. When he refused, Libby brought a civil rights action against the state. The case “was finally settled out of court, resulting in the Oregon Department of Justice sending letters to all of the prosecutor’s correspondents that Libby had been acquitted.” [FN143]

Prosecutors justified their extrajudicial conduct on two grounds. First, they knew that the defense experts were wrong as a matter of *75 science. [FN144] Yet the views of prosecutors (and defense attorneys) on scientific matters have often been notoriously wrong. For example, the paraffin test for the detection of gunshot residue was introduced in this country in the 1930s and admitted at trial for over thirty years before it was debunked. [FN145] Similarly, “voiceprint” evidence was admitted in numerous trials in the 1970s until a NAS report undercut its reliability. [FN146] Attorneys typically lack the educational background to evaluate scientific issues, [FN147] and the adversarial process frequently distorts any objectivity that they might otherwise have. [FN148] Second, prosecutors were apparently offended that some defense experts were compensated. [FN149] This criticism ignores the fees collected by prosecution witnesses [FN150] and their government-subsidized research grants. [FN151]

More importantly, attacking defense experts outside the courtroom further exacerbates the profound imbalance of resources in criminal cases. [FN152] Prosecutors typically have access to the over three hundred crime *76 laboratories in this country. [FN153] In addition to the FBI facility, the Drug Enforcement Administration; Internal Revenue Service; Postal Inspection Service; Secret Service; Bureau of Alcohol, Tobacco and Firearms; Customs Service; and the military operate crime laboratories. [FN154] These laboratories often provide their services for free to state law enforcement agencies. [FN155]

In contrast, the defense often encounters problems securing expert assistance. Most defendants are indigent and cannot afford experts. [FN156] Although the Supreme Court recognized a due process right to an expert in *Ake v. Oklahoma*, [FN157] studies indicate that the right has not been fully implemented and the asymmetry in resources is pronounced. [FN158] A study of indigent defense systems by the National Center for State Courts noted that the “greatest disparities occur in the areas of investigators and *77 expert witnesses, with the prosecutors possessing more resources.” [FN159] A recent book concluded that “prosecution experts were much more common than experts called by the defense.” [FN160] The NAS 1992 DNA Report also recognized the need for defense experts. [FN161] Yet no defendant, no matter how rich, can conduct extensive empirical studies. A defense expert in a particular case can critique the bases of a prosecution expert’s opinion but can rarely replicate the research upon which that opinion rests.

Of course, if the FBI had made its data publicly available, research scientists could have analyzed it, published

their conclusions in peer-review journals, and the debate would have been fought out in public, probably saving the taxpayers money in the long run. “According to long-standing and wise scientific tradition, the data underlying an important scientific conclusion must be freely available, so that others can evaluate the results and publish their own findings, whether in support or in disagreement.” [FN162] Moreover, “[i]f scientific evidence is not yet ready for both scientific scrutiny and public re-evaluation by others, it is not yet ready for court.” [FN163]

F. The Aftermath

In the end, the defense's challenges to DNA evidence had a salutary effect. As one scholar noted, the British Forensic Science Service “adopted a method of calculating DNA match probabilities that had been proposed by statisticians associated with the defence side of the *78 DNA dispute.” [FN164] Even the DNA experts who worked closely with the FBI subsequently conceded that “most would now agree that this extended debate has been good for the science.” [FN165] Unfortunately, defendants were being tried and convicted while this process unfolded.

In sum, the government shaped science by controlling the research agenda, hiding unwelcome test results, attacking legitimate studies that were unfavorable, harassing scientists who disagreed, and “spinning” science in the press. As discussed in the next Parts of this Article, some of these tactics were repeated in later controversies.

IV. Fingerprinting

As discussed previously, after the Supreme Court decided *Daubert*, a number of forensic sciences came under attack. These techniques had gained admissibility long before *Daubert* was decided and were not supported by the type of scientific research that undergirded DNA profiling. Fingerprinting, the gold standard in forensic science before DNA analysis, provoked the greatest controversy.

A. Controlling Research

When fingerprint evidence was challenged, [FN166] FBI experts launched a full-bore defense of the technique, insisting in court testimony that the “error rate for the method is zero.” [FN167] In response to the first post-*Daubert* evidentiary attack in *United States v. Mitchell*, [FN168] the FBI attempted to support its position by conducting two studies. In one, the FBI distributed Mitchell's ten-point fingerprint card and two latent prints from the crime scene to numerous fingerprint examiners and asked them to make a comparison. “Of the thirty-four agencies that responded, nine (27%) reported that they had not identified either one or both of the latent prints with any of the fingers on Mitchell's ten print card.” [FN169] Faced with these troublesome results, the FBI recontacted these agencies, providing more information, including enlarged photographs, pointing out *79 their mistake, and asking for a do-over. The FBI letter to these agencies, disclosed in discovery, reads in part: “Please test your prior conclusions against these enlarged photographs with the marked characteristics.” [FN170] In short, the “test” was rigged.

Lockheed Martin conducted the second test sponsored by the FBI, known as the 50K study, which involved 50,000 fingerprint images taken from the FBI's Automated Fingerprint System, a computer database. Although the study proved persuasive in court, [FN171] commentators criticized it. [FN172] For example, one scholar asserted that the “study addresses the irrelevant question of whether one image of a fingerprint is immensely more similar to itself than to other images—including those of the same finger.” [FN173] In contrast, the relevant issue is whether crime scene prints, which are typically distorted, smudged, and one-fifth of the size of record prints, are unique. The Lockheed Martin study, which was never published, did not address this issue. [FN174]

In addition, the rigor of proficiency testing was drawn into question in one case when a fingerprint examiner from New Scotland Yard testified that the FBI proficiency tests were deficient: “It's not testing their ability. It doesn't test their expertise. . . . And if I gave my experts these tests, they'd fall about laughing.” [FN175] A district court agreed, noting that “the FBI examiners got very high proficiency grades, but the tests they took did not. . . .

[O]n the present record I conclude that the proficiency tests are less demanding than they should be.” [FN176] A later FBI report implicitly acknowledged this shortcoming. [FN177]

*80 B. Suppressing Independent Studies

During the early stages of the Mitchell litigation, the National Institute of Justice was preparing to release a solicitation for fingerprint research. The “Introduction” to the solicitation stated that Daubert “require[d] scientists to address the reliability and validity of the methods used in their analysis. Therefore, the purpose of [the] solicitation is to . . . provide greater scientific foundation for forensic friction ridge (fingerprint) identification.” [FN178] A DOJ solicitation for greater scientific support for fingerprints carried the risk of undermining FBI claims that the technique was on solid footing. After the Mitchell trial, the defense attorney learned that the solicitation had been postponed, arguably so it could not be used to support the defense challenge in that case. [FN179] When the case reached the U.S. Court of Appeals for the Third Circuit, Judge Becker commented on the testimony of Dr. Richard Rau, the NIJ official who coordinated the drafting of the solicitation for the DOJ:

We are deeply discomforted by Mitchell’s contention—supported by Dr. Rau’s account of events, though contradicted by other witnesses—that a conspiracy within the Department of Justice intentionally delayed the release of the solicitation until after Mitchell’s jury reached a verdict. Dr. Rau’s story, if true, would be a damning indictment of the ethics of those involved. [FN180]

The story did not end there. As a result of the court challenges, a project designed to examine various forensic science techniques, including fingerprinting, was under discussion at the NAS. The project was cancelled, however, because the Departments of Justice and Defense insisted on a right of review that the Academy found unacceptable; such a right of review would violate scientific norms. In response, the editor-in-chief of *Science* wrote the “Forensic Science: Oxymoron?” editorial mentioned earlier. [FN181] He also pointed out that the NIJ “regularly resisted including comprehensive evaluations of the science underlying forensic techniques” in planning sessions for conferences sponsored with the *81 NAS, the American Association for the Advancement of Science, the American Bar Association, and the Federal Judicial Center. [FN182]

The FBI did not undertake a serious review of fingerprints until it was compelled to address the issue due to the negative publicity surrounding the Bureau’s misidentification of Brandon Mayfield as a terrorist. [FN183] One of the most telling comments about the misidentification, according to the FBI’s own report, was that the laboratory culture was poorly suited to detect mistakes: “To disagree was not an expected response.” [FN184]

Here, again, the DOJ, through the FBI and NIJ, went to great lengths to manage the research agenda on fingerprint comparisons, as it had in DNA analysis. These tactics would once again be used when the science underlying **bullet lead analysis** was challenged in court.

V. Comparative Bullet Lead Analysis

For over thirty years, FBI experts testified about **comparative bullet lead analysis** (CBLA), a technique that was first used in the investigation into President Kennedy’s assassination. [FN185] CBLA **compares** trace chemicals found in **bullets** at crime scenes with ammunition found in the possession of a suspect. This technique was used when traditional firearms identification could not be employed because, for example, the **bullet** was too mutilated or the weapon was not recovered. FBI experts used various analytical techniques (first, neutron activation analysis (NAA), and then inductively coupled plasma-atomic emission spectrometry (ICP-AES)) “to determine the concentrations of seven selected elements—arsenic (As), antimony (Sb), tin (Sn), copper (Cu), bismuth (Bi), silver (Ag), and cadmium (Cd)—in the **bullet lead** alloy of both the crime-scene and the suspect’s **bullets**.” [FN186] Statistical tests were then applied to **compare** the elements in each **bullet** and determine whether the fragments and suspect’s **bullets** were “analytically indistinguishable for each of the elemental concentration means.” [FN187] Exactly what the phrase “analytically indistinguishable” meant was the central issue—in other words, did such a finding mean that

the **bullet** fragments came from a small or large universe? The probative value of the test results would, of course, differ if only one hundred **bullets** had the same chemical composition as opposed to several million **bullets**.

*82 The technique was not seriously challenged until a retired FBI examiner, William Tobin, began questioning the procedure in scientific and legal journals [FN188] and in court testimony as well. [FN189] As a result, the FBI asked the NAS to review the technique. [FN190] The NAS appointed a committee of scientists, statisticians, and attorneys to conduct the review. [FN191]

One of the first things the committee discovered was the disparate (often inconsistent) interpretive conclusions provided by FBI experts in the reported cases. In some, experts testified only that two exhibits were “analytically indistinguishable.” [FN192] In other cases, examiners concluded that samples “could have come from the same batch” or source. [FN193] In still others, they stated that the samples came from the same source. [FN194] The testimony in numerous cases went much further and referred to a “box” of ammunition (usually fifty loaded cartridges, sometimes twenty). For example, two specimens:

- “Could have come from the same box,” [FN195]

- Could have come from the same box or a box manufactured on the same day, [FN196]

*83 • Were “consistent with their having come from the same box of ammunition,” [FN197]

- Probably came from the same box, [FN198]

- Must have come from the same box or from another box that would have been made by the same company on the same day. [FN199]

The Report noted other inconsistencies as well. [FN200]

The NAS Report, published in 2004, undercut much of the FBI testimony. The Report found that the “available data do not support any statement that a crime bullet came from a particular box of ammunition. In particular, references to ‘boxes’ of ammunition in any form should be avoided as misleading under Federal Rule of Evidence 403.” [FN201]

A. Withholding Data

Much of FBI testimony rested on a database, which the Bureau had built up over the course of many years. Although the NAS Committee frequently asked for this data during its year-long investigation, the FBI did not turn over the data until it was too late to include an analysis of the information in its report. [FN202] The two statisticians who served on the NAS Committee would later write that their subsequent inspection of the data “identified several peculiarities.” [FN203] First, the database was incomplete. The FBI claimed to have a “complete data file” of some 71,000+ measurements but only 64,869 were turned over. [FN204] Moreover, *84 only measurements made by ICP-AES were included; a different analytical method, NAA, had been used before 1997. [FN205] Both techniques measured the same elements, and therefore the results from either technique would have been suitable for comparison. Further, the numbering system for the bullets was “highly inconsistent and rather unexpected,” suggesting that some bullet measurements had been deleted. [FN206] Additionally, “a rough investigation of the measurement error indicated many measurement errors that exceeded the FBI’s claimed analytical precision of 2-5%” [FN207] Finally, “only 15% of the 1,079 cases listed in these two files had measurements from [National Institute of Standards and Technology] . . . making it impossible to determine the frequency of matches” in some cases. [FN208] Accordingly, the “missing data and the inconsistent precisions” undermined the Bureau’s public claims. [FN209]

As researchers steeped in the traditions of science, these authors were puzzled by the FBI's failure to disclose data. They wrote: "The scientific method is important for science generally; forensic science is no exception. . . . [T]he evidence in this paper suggests that, at least for CBLA, forensic science failed in the requirement to share the materials, methods, and data used to reach conclusions with the scientific community." [FN210]

In short, the NAS Committee, appointed at the behest of and funded by the FBI, was not provided with critical data that would have assisted it in evaluating the technique. This data formed the basis of the Bureau's testimony in about five hundred prosecutions, including death penalty cases. [FN211] Perhaps the most disturbing case is *Earhart v. State*, [FN212] a capital murder case in which CBLA evidence apparently played a significant role. [FN213] The trial transcript contains the following expert testimony: *85 "[F]rom my 21 years experience of doing bullet lead analysis and doing research on boxes of ammunition down through the years I can determine if bullets came from the same box of ammunition" [FN214] According to the NAS Committee, however, the amount of bullets that can be produced from an "analytically indistinguishable" melt "can range from the equivalent of as few as 12,000 to as many as 35 million 40-grain, .22 caliber longrifle bullets." [FN215] In other words, tens of thousands of boxes could have been involved, which would have greatly undercut the probative value of the evidence. *Earhart* was executed before the Report was released. [FN216]

B. Spinning Science

The FBI's response to the NAS Report was also disconcerting. The Bureau quickly put out a press release, obscuring the Report's findings. [FN217] The release highlighted the Committee's conclusion that the FBI was using appropriate instrumentation and the correct elements for comparison. Yet these aspects of CBLA were never seriously questioned. Rather, the interpretation of the data was disputed. Only one sentence in the press release addressed this important issue: "Recommendations by the [NAS] included suggestions to improve the statistical analysis, quality control procedures, as well as expert testimony." [FN218] The news media read the Report quite differently—for example, "Study Shoots Holes in Bullet Analyses by FBI," [FN219] "Report Finds Flaws," [FN220] "Scientific Panel Questions *86 FBI Bullet Analysis Method," [FN221] and "Report Questions the Reliability of an F.B.I. Ballistics Test." [FN222]

The FBI also included the following passage in the press release: "The basis of bullet lead compositional analysis is supported by approximately 50 peer-reviewed articles found in scientific publications beginning in the early 1970's. Published research and validation studies have continued to demonstrate the usefulness of the measurement of trace elements within bullet lead." [FN223] In contrast, the NAS Report pointed out that there were "very few peer-reviewed articles on homogeneity and the rate of false positive matches" and "[o]utside reviews have only recently been published." [FN224] In effect, the FBI cherry-picked favorable statements from the Report and downplayed the unfavorable crucial findings.

Over one year later, the FBI discontinued CBLA testing, [FN225] issuing another slanted press release. Once again, the release minimized the problems, citing the following reason for its decision: "While the FBI Laboratory still firmly supports the scientific foundation of bullet lead analysis, given the costs of maintaining the equipment, the resources necessary to do the examination, and its relative probative value, the FBI Laboratory has decided that it will no longer conduct this exam." [FN226] Nevertheless, a month earlier, Dwight Adams, then laboratory director, had written a memorandum to the FBI Director specifying different reasons for abandoning the technique, including the following comments: (1) "[w]e cannot afford to be misleading to a jury" and (2) "[w]e plan to discourage prosecutors from using our previous results in future prosecutions." [FN227] Neither concern was reflected in the press release.

In the wake of the NAS Report, several state courts excluded CBLA evidence. [FN228] Surprisingly, the FBI supplied affidavits in several *87 cases supporting prosecutors' efforts to sustain convictions based on the technique.

In one affidavit, the FBI cited the NAS Report but failed to mention that the Report had faulted the FBI's statistical methods. The chair of the NAS Committee criticized the affidavit because it did "not discuss the statistical bullet-matching technique, which is key and probably the most significant scientific flaw found by the committee." [FN229] The affidavit was also misleading because it estimated that the maximum number of .22 caliber bullets in a batch of lead was 1.3 million, when the NAS Committee found that the number could be as high as 35 million. [FN230]

On November 18, 2007, 60 Minutes aired a segment on CBLA. [FN231] In an interview, Dwight Adams, the now retired FBI lab director, acknowledged that testimony about boxes was "misleading and inappropriate." [FN232] That broadcast, along with a Washington Post investigation, questioned the FBI's response to the NAS Report. [FN233] The main problem was that only the FBI had records of all the cases in which its experts had testified, and the FBI had declined to disclose the names of those cases. [FN234] Instead, the FBI relied on the NAS Report, its own press releases, and pro forma letters sent to prosecution and defense organizations to notify defendants. This method of communication was grossly inadequate because the letters neither highlighted the problem nor its significance. [FN235] A few days after the 60 Minutes expose, Senator Patrick Leahy, the Chairman of the Senate Judiciary Committee, sent a letter to the FBI Director, noting that the FBI's letters gave "the false impression that these discredited tests had continuing reliability." [FN236]

*88 VI. Prelude to the NAS Forensic Science Report

As noted earlier, the NAS appointed its forensic science committee in 2006. [FN237] The appointment of a committee with so many independent scientists was apparently a threat to the DOJ. [FN238] On April 10, 2008, at a subcommittee hearing, Senator Richard Shelby, Republican of Alabama, stated that individuals at NIJ had "attempted to derail the [Fiscal Year 2006] report language that [he] requested, directing the National Academy of Sciences to conduct an independent forensics study" and that "[c]urrent and former employees at [NIJ], along with lobbyists and contractors, have attempted to undermine and influence the National Academies study." [FN239] The Senator also objected to a NIJ-convened summit designed to undercut the NAS study. [FN240] He elaborated:

[My] staff discovered potential conflicts of interest, unethical behavior, and a serious void of transparency where lobbyists, including former DOJ employees, were contracted to NIJ to conduct policy forming studies and surveys. These same lobbyists . . . are also representing clients whose business success depends on the results of the studies and surveys their lobbyists conducted. [FN241]

Senator Shelby was not the only one with a dim view of the DOJ. In a presentation to the Committee, an expert from the Secret Service "blasted the F.B.I. for developing questionable techniques 'on an ad-hoc basis, without proper research.' He said the Secret Service wanted the National Academy 'to send a message to the entire forensic science community that this type of method development is not acceptable practice.'" [FN242]

VII. Conclusion

In *Daubert*, the Supreme Court emphasized the importance of empirical research. [FN243] The Court quoted Hempel: "[T]he statements constituting*89 a scientific explanation must be capable of empirical test," [FN244] and then Popper: "[T]he criterion of the scientific status of a theory is its falsifiability, or refutability, or testability." [FN245] In their amici brief in *Daubert*, the *New England Journal of Medicine* and other medical journals observed:

"Good science" is a commonly accepted term used to describe the scientific community's system of quality control which protects the community and those who rely upon it from unsubstantiated scientific analysis. It mandates that each proposition undergo a rigorous trilogy of publication, replication and verification before it is relied upon. [FN246]

Such research is precisely what the NAS Report found to be lacking with many forensic techniques. In addressing the lack of funding, the Report commented: "Of the various facets of underresourcing, the committee is most

concerned about the knowledge base. Adding more dollars and people to the enterprise might reduce case backlogs, but it will not address fundamental limitations in the capabilities of forensic science disciplines to discern valid information from crime scene evidence.” [FN247] The Report also observed:

A body of research is required to establish the limits and measures of performance and to address the impact of sources of variability and potential bias. Such research is sorely needed, but it seems to be lacking in most of the forensic disciplines that rely on subjective assessments of matching characteristics. [FN248]

Scientists with impeccable credentials should conduct the needed research. Moreover, they should be independent of law enforcement. The most thorough and well-reasoned reports in the field have come from impartial scientific investigations, most done by the NAS, including reports on voiceprints, [FN249] DNA, [FN250] polygraph, [FN251] and bullet lead analysis. [FN252] The process should also be transparent. Scientists “are generally expected to exchange research data as well as unique research materials that are essential to the replication or extension of reported findings.” [FN253]

*90 The government has not only failed to conduct the needed research, it has thwarted efforts to do so. Indeed, the conduct described in this Article rivals that of some private corporations such as the tobacco industry [FN254]—shaping the research agenda, limiting access to data, attacking experts who disagree with its positions, and “spinning” negative reports. Currently, we have the worst of two possible worlds. Basic research in the forensic sciences is weak, and the only agency currently capable of funding research, the DOJ, is sabotaging efforts to conduct rigorous independent studies.

The NAS Report on forensic science provides a blueprint for rectifying this problem. Adoption of all recommendations would be the most important development in forensic science since the establishment of the crime laboratory in the mid-1920s. [FN255] The centerpiece of the NAS Report is the creation of an independent federal agency to control funding and research in the field. This Article provides evidence supporting this proposal. Congress should act on the NAS recommendation and establish a National Institute of Forensic Sciences.

[FN1]. Albert J. Weatherhead III & Richard W. Weatherhead Professor of Law, Case Western Reserve University. University of Virginia, J.D., 1970, LL.M., 1975; George Washington University, M.S. Forensic Science, 1973. Copyright 2011.

[FN1]. *Melendez-Diaz v. Massachusetts*, 129 S. Ct. 2527, 2536 (2009). The Court also observed: “Serious deficiencies have been found in the forensic evidence used in criminal trials.” *Id.* at 2537.

[FN2]. Nat’l Research Council, Nat’l Acad. of Scis., *Strengthening Forensic Science in the United States: A Path Forward* (2009) [hereinafter *NAS Forensics Report*]. On November 22, 2005, the Science, State, Justice, Commerce, and Related Agencies Appropriations Act of 2006 became law. Pub. L. No. 109-108, 119 Stat. 2290 (2005). The statute authorized “the National Academy of Sciences to conduct a study on forensic science, as described in the Senate report.” H.R. Rep. No. 109-272, at 121 (2005) (Conf. Rep.). The Senate Report states:

While a great deal of analysis exists of the requirements in the discipline of DNA, there exists little to no analysis of the remaining needs of the community outside of the area of DNA. Therefore ... the Committee directs the Attorney General to provide [funds] to the National Academy of Sciences to create an independent Forensic Science Committee. This Committee shall include members of the forensics community representing operational crime laboratories, medical examiners, and coroners; legal experts; and other scientists as determined appropriate.

S. Rep. No. 109-88, at 46 (2005). The Committee was appointed in the fall of 2006. *NAS Forensics Report*, *supra*, at 2.

[FN3]. *NAS Forensics Report*, *supra* note 2, at 100.

[FN4]. *Id.* at 22 (emphasis added).

[FN5]. See *People v. Jennings*, 96 N.E. 1077, 1082 (Ill. 1911). See generally 1 Paul C. Giannelli & Edward J. Imwinkelried, Jr., *Scientific Evidence* ch. 16 (4th ed. 2007) (discussing the scientific and legal issues associated with fingerprint identification).

[FN6]. See D. Michael Risinger et al., *Exorcism of Ignorance as a Proxy for Rational Knowledge: The Lessons of Handwriting Identification “Expertise,”* 137 U. Pa. L. Rev. 731, 762 (1989). Handwriting comparison testimony was used extensively at the Lindbergh kidnapping trial in 1935. *Id.* at 770. See generally 2 Giannelli & Imwinkelried, *supra* note 5, ch. 21 (discussing the scientific and legal issues associated with questioned document examinations).

[FN7]. The Sacco and Vanzetti trial in 1921 was one of the earliest cases to rely on firearms identification evidence. See G. Louis Joughin & Edmund M. Morgan, *The Legacy of Sacco and Vanzetti* 10, 14-16 (1948); see also James E. Starrs, *Once More unto the Breach: The Firearms Evidence in the Sacco and Vanzetti Case Revisited: Part II*, 31 *J. Forensic Sci.* 1050 (1986). See generally 1 Giannelli & Imwinkelried, *supra* note 5, ch. 14 (discussing the scientific and legal issues associated with firearms and tool mark identifications).

[FN8]. NAS Forensics Report, *supra* note 2, at 154.

[FN9]. *Id.* at 166.

[FN10]. *Id.* at 144.

[FN11]. *Id.* at 161. The Report also states: “There is no science on the reproducibility of the different methods of [bite mark] analysis that lead to conclusions about the probability of a match.” *Id.* at 174.

[FN12]. *Id.* at 4 (“[I]mprecise or exaggerated expert testimony has sometimes contributed to the admission of erroneous or misleading evidence.”).

[FN13]. *Id.* at 47 (“The insistence by some forensic practitioners that their disciplines employ methodologies that have perfect accuracy and produce no errors has hampered efforts to evaluate the usefulness of the forensic science disciplines.”).

[FN14]. *Id.* at 104.

[FN15]. *Id.* at 143 (“Some in the latent print community [assert] that the method itself, if followed correctly...has a zero error rate. Clearly, this assertion is unrealistic.... The method, and the performance of those who use it, are inextricably linked, and both involve multiple sources of error (e.g., errors in executing the process steps, as well as errors in human judgment).”); see also *id.* at 142.

[FN16]. *Id.* at 6.

[FN17]. *Id.* at 21-22 (“Forensic reports, and any courtroom testimony stemming from them, must include clear characterizations of the limitations of the analyses, including measures of uncertainty in reported results and associated estimated probabilities where possible.”).

[FN18]. *Id.* at 19-20 (Recommendation 1). This agency would have an “administrator and an advisory board with expertise in research and education, the forensic science disciplines, physical and life sciences, forensic pathology, engineering, information technology, measurements and standards, testing and evaluation, law, national security, and public policy.” *Id.* at 19.

[FN19]. *Id.* at 20. Other recommendations include the accreditation of crime laboratories, funding research to determine the reliability of forensic evidence, and undertaking studies on the consequences of human observer bias. *Id.* at 22-25.

[FN20]. *Id.* at 19-20.

[FN21]. *Id.* at 24 (Recommendation 4). See generally Paul C. Giannelli, Independent Crime Laboratories: The Problem of Motivational and Cognitive Bias, 2010 Utah L. Rev. 247 (discussing the controversy surrounding the NAS recommendation for the removal of crime laboratories from the administrative control of law enforcement agencies).

[FN22]. NAS Forensics Report, *supra* note 2, at 17.

[FN23]. For example, there are other ways to provide defense expertise. See Paul C. Giannelli, Ake v. Oklahoma: The Right to Expert Assistance in a Post-Daubert, Post-DNA World, 89 Cornell L. Rev. 1305, 1416-18 (2004).

[FN24]. NAS Forensics Report, *supra* note 2, at 18.

[FN25]. *Id.*

[FN26]. *Id.*

[FN27]. *Id.* at 16. The Report also stated: “Neither has the full confidence of the larger forensic science community. And because both are part of a prosecutorial department of the government, they could be subject to subtle contextual biases that should not be allowed to undercut the power of forensic science.” *Id.*

[FN28]. *Id.* at 18.

[FN29]. Perhaps, in drawing a blueprint for the future, the NAS Committee wanted to avoid unnecessary controversy. The Report’s title emphasizes this point—“A Path Forward.”

[FN30]. Sheila Jasanoff, Transparency in Public Science: Purposes, Reasons, Limits, 69 Law & Contemp. Probs. 21, 21 (2006).

[FN31]. See *infra* Part VI.

[FN32]. In a famous passage, the Supreme Court wrote:

The United States Attorney is the representative not of an ordinary party to a controversy, but of a sovereignty whose obligation to govern impartially is as compelling as its obligation to govern at all; and whose interest, therefore, in a criminal prosecution is not that it shall win a case, but that justice shall be done. As such, he is in a peculiar and very definite sense the servant of the law, the twofold aim of which is that guilt shall not escape or innocence suffer. He may prosecute with earnestness and vigor—indeed, he should do so. But, while he may strike hard blows, he is not at liberty to strike foul ones. It is as much his duty to refrain from improper methods calculated to produce a wrongful conviction as it is to use every legitimate means to bring about a just one.

Berger v. United States, 295 U.S. 78, 88 (1935).

[FN33]. These are not the only examples. Government-sponsored research into handwriting comparisons provides another illustration. Professor Michael Saks “has repeatedly requested the data from those [handwriting] studies for purposes of re-examination, and has repeatedly been denied, despite the fact that the youngest of the data sets is now

well over three years old and hence well beyond the usual two-year presumptive period of exclusive use.” D. Michael Risinger & Michael J. Saks, Rationality, Research and Leviathan: Law Enforcement-Sponsored Research and the Criminal Process, 2003 Mich. St. L. Rev. 1023, 1045 (citation omitted). These authors also write: “Various strategies appear to have been used to insure that any positive results will be exaggerated and any negative results will be glossed over.” *Id.* at 1042; see also D. Michael Risinger et al., Brave New “Post-Daubert World”—A Reply to Professor Moenssens, 29 Seton Hall L. Rev. 405, 430-33 (1998) (discussing early refusals to share data from government-funded research on handwriting).

[FN34]. See *infra* notes 91-95 and accompanying text.

[FN35]. 509 U.S. 579 (1993). The Court followed with General Electric Co. v. Joiner, 522 U.S. 136 (1997), and Kumho Tire Co. v. Carmichael, 526 U.S. 137 (1999), to make up what is known as the Daubert trilogy. Daubert is one of the most important evidence cases ever decided. See United States v. Alatorre, 222 F.3d 1098, 1100 (9th Cir. 2000) (“Daubert has become ubiquitous in federal trial courts.”); United States v. Barnette, 211 F.3d 803, 815 (4th Cir. 2000) (“In Daubert, the Supreme Court radically changed the standard for admissibility of scientific testimony.”).

[FN36]. Michael J. Saks & Jonathan J. Koehler, Review, The Coming Paradigm Shift in Forensic Identification Science, 309 Science 892, 894-95 (2005).

[FN37]. See Michael Lynch, Review, God's Signature: DNA Profiling, the New Gold Standard in Forensic Science, 27 Endeavour 93 (2003); Joseph L. Peterson & Anna S. Leggett, The Evolution of Forensic Science: Progress Amid the Pitfalls, 36 Stetson L. Rev. 621, 654 (2007) (“The scientific integrity and reliability of DNA testing have helped DNA replace fingerprinting and made DNA evidence the new ‘gold standard’ of forensic evidence.”).

[FN38]. See David L. Faigman, Is Science Different for Lawyers?, 297 Science 339, 340 (2002) (“Daubert initiated a scientific revolution in the law.”).

[FN39]. See generally William C. Thompson, Evaluating the Admissibility of New Genetic Identification Tests: Lessons from the “DNA War,” 84 J. Crim. L. & Criminology 22 (1993) (discussing the controversy surrounding DNA admissibility and lessons to be derived from the debate).

[FN40]. Nat'l Research Council, Nat'l Acad. of Scis., DNA Technology in Forensic Science 55 (1992) [hereinafter NAS DNA Report I]. A second report followed. See Nat'l Research Council, Nat'l Acad. of Scis., The Evaluation of Forensic DNA Evidence (1996) [hereinafter NAS DNA Report II]. The FBI requested and funded both reports. The second report also recommended proficiency testing. *Id.* at 88 (“Recommendation 3.2: Laboratories should participate regularly in proficiency tests, and the results should be available for court proceedings.”).

[FN41]. Michael J. Saks & Jonathan J. Koehler, What DNA “Fingerprinting” Can Teach the Law About the Rest of Forensic Science, 13 Cardozo L. Rev. 361, 372 (1991). Professor Zabell would later note that “DNA identification has not only transformed and revolutionized forensic science, it has also created a new set of standards that have raised expectations for forensic science in general.” Sandy L. Zabell, Fingerprint Evidence, 13 J.L. & Pol'y 143, 143 (2005). Similarly, Professor Mnookin observed that “[o]ne consequence of DNA profiling and its admissibility into court is that it has opened the door to challenging fingerprinting.” Jennifer L. Mnookin, Fingerprint Evidence in an Age of DNA Profiling, 67 Brook. L. Rev. 13, 43 (2001).

[FN42]. Eric S. Lander, Commentary, DNA Fingerprinting on Trial, 339 Nature 501, 505 (1989). Even today, only a few states require accreditation. See N.Y. Exec. Law §995b (McKinney 1996 & Supp. 2010) (requiring accreditation by the state Forensic Science Commission); Okla. Stat. Ann. tit. 74, §150.37 (West Supp. 2009) (requiring accreditation by the American Society of Crime Laboratory Directors/Laboratory Accreditation Board (ASCLD/LAB)).

or the American Board of Forensic Toxicology); Tex. Code Crim. Proc. Ann. art. 38.35 (West Supp. 2009) (requiring accreditation by the Department of Public Safety). Texas also created a Forensic Science Commission. Tex. Code Crim. Proc. Ann. art. 38.01 (West Supp. 2009).

[FN43]. See Samuel R. Gross et al., Exonerations in the United States: 1989 Through 2003, 95 *J. Crim. L. & Criminology* 523, 527-31, 542-46 (2005).

[FN44]. A study of 200 DNA exonerations found that expert testimony regarding forensic evidence (57%) was the second leading type of evidence (after eyewitness identifications, 79%) used in the wrongful conviction cases. The study indicated that forensic evidence was introduced in 113 trials

with serological analysis of blood or semen the most common (79 cases), followed by expert comparison of hair evidence (43 cases), soil comparison (5 cases), DNA tests (3 cases), bite mark evidence (3 cases), fingerprint evidence (2 cases), dog scent identification (2 cases), spectrographic voice evidence (1 case), shoe prints (1 case), and fiber comparison (1 case).

Brandon L. Garrett, Judging Innocence, 108 *Colum. L. Rev.* 55, 76, 78, 81 (2008). This data does not necessarily mean that the forensic evidence was improperly used. For example, serological testing at the time of many of these convictions was simply not as discriminating as DNA profiling. Consequently, a person could be included using these serological tests but be excluded by DNA analysis. Some evidence, however, was clearly misused.

[FN45]. See Brandon L. Garrett & Peter J. Neufeld, Invalid Forensic Science Testimony and Wrongful Convictions, 95 *Va. L. Rev.* 1, 14-15 (2009) (“Of the 100 cases involving serology in which transcripts were located, 57 cases, or 57% had invalid forensic science testimony. Of the 65 cases involving microscopic hair comparison in which transcripts were located, 25 cases, or 38% had invalid forensic science testimony.”); Paul C. Giannelli, Wrongful Convictions and Forensic Science: The Need to Regulate Crime Labs, 86 *N.C. L. Rev.* 163, 166-70 (2007).

[FN46]. See Paul C. Giannelli, Bite Mark Analysis, 43 *Crim. L. Bull.* 930, 939-40 (2007).

[FN47]. See Paul C. Giannelli, Microscopic Hair Comparisons: A Cautionary Tale, 46 *Crim. L. Bull.* 531 (2010) (discussing the DNA exoneration cases in which hair evidence was used to convict the innocent); Clive A. Stafford Smith & Patrick D. Goodman, Forensic Hair Comparison Analysis: Nineteenth Century Science or Twentieth Century Snake Oil?, 27 *Colum. Hum. Rts. L. Rev.* 227, 231 (1996) (“If the purveyors of this dubious science cannot do a better job of validating hair analysis than they have done so far, forensic hair comparison analysis should be excluded altogether from criminal trials.”).

[FN48]. Daubert v. Merrell Dow Pharm., Inc., 509 U.S. 579, 593 (1993) (“Ordinarily, a key question to be answered in determining whether a theory or technique is scientific knowledge that will assist the trier of fact will be whether it can be (and has been) tested.”).

[FN49]. See Carl G. Hempel, Philosophy of Natural Science 49 (1966) (“[T]he statements constituting a scientific explanation must be capable of empirical test.”); Karl R. Popper, Conjectures and Refutations: The Growth of Scientific Knowledge 37 (5th ed. 1989) (“[T]he criterion of the scientific status of a theory is its falsifiability, or refutability, or testability.” (emphasis omitted)).

[FN50]. Daubert, 509 U.S. at 593 (“[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.”).

[FN51]. Id. at 594 (“Widespread acceptance can be an important factor in ruling particular evidence admissible, and ‘a known technique which has been able to attract only minimal support within the community,’ may properly be viewed with skepticism.” (quoting United States v. Downing, 753 F.2d 1224, 1238 (1985))).

[FN52]. *Id.*

[FN53]. 880 F. Supp. 1027 (S.D.N.Y. 1995).

[FN54]. *Id.* at 1038 (quoting Fed. R. Evid. 702). The court further stated that “while scientific principles may relate to aspects of handwriting analysis, they have little or nothing to do with the day-to-day tasks performed by [Forensic Document Examiners].... [T]his attenuated relationship does not transform the FDE into a scientist.” *Id.* at 1041. Nevertheless, the court did not exclude handwriting comparison testimony. Instead, the court admitted the testimony as “technical” evidence. *Id.* at 1047. This aspect of the opinion, however, was later undercut by *Kumho Tire Co. v. Carmichael*, 526 U.S. 137, 149 (1999), in which the Supreme Court ruled that Daubert’s reliability test applied to all expert testimony, thereby abolishing the distinction between “scientific” and “technical” expertise.

[FN55]. See, e.g., *United States v. Hidalgo*, 229 F. Supp. 2d 961, 967 (D. Ariz. 2002) (“Because the principle of uniqueness is without empirical support, we conclude that a document examiner will not be permitted to testify that the maker of a known document is the maker of the questioned document. Nor will a document examiner be able to testify as to identity in terms of probabilities.”); *United States v. Lewis*, 220 F. Supp. 2d 548, 554 (S.D.W. Va. 2002) (“[Expert’s] bald assertion that the ‘basic principle of handwriting identification has been proven time and time again through research in [his] field,’ without more specific substance, is inadequate to demonstrate testability and error rate.”); *United States v. Saelee*, 162 F. Supp. 2d 1097, 1103 (D. Alaska 2001) (“There is little known about the error rates of forensic document examiners. The little testing that has been done raises serious questions about the reliability of methods currently in use. As to some tasks, there is a high rate of error and forensic document examiners may not be any better at analyzing handwriting than laypersons.”).

[FN56]. See *United States v. Oskowitz*, 294 F. Supp. 2d 379, 384 (E.D.N.Y. 2003) (“Many other district courts have similarly permitted a handwriting expert to analyze a writing sample for the jury without permitting the expert to offer an opinion on the ultimate question of authorship.”); *United States v. Rutherford*, 104 F. Supp. 2d 1190, 1194 (D. Neb. 2000) (“[T]he Court concludes that FDE Rauscher’s testimony meets the requirements of Rule 702 to the extent that he limits his testimony to identifying and explaining the similarities and dissimilarities between the known exemplars and the questioned documents. FDE Rauscher is precluded from rendering any ultimate conclusions on authorship of the questioned documents and is similarly precluded from testifying to the degree of confidence or certainty on which his opinions are based.”); *United States v. Hines*, 55 F. Supp. 2d 62, 70-71 (D. Mass. 1999) (admitting expert testimony concerning the general similarities and differences between a defendant’s handwriting exemplar and a stick up note, but not the specific conclusion that the defendant was the author).

[FN57]. See, e.g., *Lewis*, 220 F. Supp. 2d at 554 (excluding testimony); *United States v. Fujii*, 152 F. Supp. 2d 939, 940 (N.D. Ill. 2000) (“Handwriting analysis does not stand up well under the Daubert standards. Despite its long history of use and acceptance, validation studies supporting its reliability are few, and the few that exist have been criticized for methodological flaws.”).

[FN58]. *Hines*, 55 F. Supp. 2d at 67 (discussing handwriting comparison); see also *Hidalgo*, 229 F. Supp. 2d at 966 (“Courts are now confronting challenges to testimony [such as handwriting comparison], as here, whose admissibility had long been settled.”).

[FN59]. (*Llera Plaza I*), 179 F. Supp. 2d 492 (E.D. Pa. 2002), vacated, motion granted on reconsideration, 188 F. Supp. 2d 549 (E.D. Pa. 2002).

[FN60]. See D.H. Kaye, *The Nonscience of Fingerprinting: United States v. Llera-Plaza*, 21 *Quinnipiac L. Rev.* 1073, 1073 (2003).

[FN61]. *Llera Plaza I*, 179 F. Supp. 2d at 518 (“But no expert witness for any party will be permitted to testify that,

in the opinion of the witness, a particular latent print is—or is not—the print of a particular person.”).

[FN62]. The first reported fingerprint case was decided in 1911. People v. Jennings, 96 N.E. 1077 (Ill. 1911). As Professor Mnookin has noted, however, “fingerprints were accepted as an evidentiary tool without a great deal of scrutiny or skepticism.” Mnookin, *supra* note 41, at 17. She elaborated:

Even if no two people had identical sets of fingerprints, this did not establish that no two people could have a single identical print, much less an identical part of a print. These are necessarily matters of probability, but neither the court in Jennings nor subsequent judges ever required that fingerprint identification be placed on a secure statistical foundation.

Id. at 19.

[FN63]. United States v. Llera Plaza (Llera Plaza II), 188 F. Supp. 2d 549, 575-76 (E.D. Pa. 2002). Llera Plaza II was not a total victory for the prosecution. The rigor of proficiency testing was drawn into question. See *infra* Part IV.A.

[FN64]. See, e.g., United States v. Mitchell, 365 F.3d 215, 246 (3d Cir. 2004); United States v. Crisp, 324 F.3d 261, 268-70 (4th Cir. 2003); United States v. Sullivan, 246 F. Supp. 2d 700, 704 (E.D. Ky. 2003).

[FN65]. In State v. Rose, No. K06-0545 (Md. 2007), a trial judge excluded fingerprint evidence. See James E. Starrs, *Will Wonders Never Cease? Fingerprinting Denied Its Day in Maryland Trial Court*, *Sci. Sleuthing Rev.*, Fall 2007, at 1 (discussing case).

[FN66]. E.g., Associated Press, *Fingerprint Reliability Under Fire—As a Forensic Tool, It's Not Foolproof, Critics Argue in Federal Court*, *Sun-Sentinel*, Feb. 25, 2002, at 3A; Andy Newman, *Judge Who Ruled Out Matching Fingerprints Changes His Mind*, *N.Y. Times*, Mar. 14, 2002, at A27; Joseph A. Slobodzian, *Court Ruling Blurs the Future for Fingerprint Experts: Linking of Print to Person Not Credible, Federal Judge Says*, *Milwaukee J. Sentinel*, Feb. 17, 2002, at A2; Richard Willing, *Judge Challenges Fingerprint Identification*, *USA Today*, Jan. 10, 2002, at 3A.

[FN67]. E.g., Michael Specter, *Do Fingerprints Lie? The Gold Standard of Forensic Evidence Is Now Being Challenged*, *New Yorker*, May 27, 2002, at 96, 102-05 (discussing Llera Plaza, including an interview with Judge Pollak).

[FN68]. See Faigman, *supra* note 38, at 339-40.

[FN69]. *60 Minutes: Fingerprints* (CBS television broadcast Jan. 5, 2003).

[FN70]. E.g., Simon A. Cole, *Grandfathering Evidence: Fingerprint Admissibility Rulings from Jennings to Llera Plaza and Back Again*, 41 *Am. Crim. L. Rev.* 1189 (2004); Robert Epstein, *Fingerprints Meet Daubert: The Myth of Fingerprint “Science” Is Revealed*, 75 *S. Cal. L. Rev.* 605 (2002); Nathan Benedict, Note, *Fingerprints and the Daubert Standard for Admission of Scientific Evidence: Why Fingerprints Fail and a Proposed Remedy*, 46 *Ariz. L. Rev.* 519 (2004); Tara Marie La Morte, Comment, *Sleeping Gatekeepers: United States v. Llera Plaza and the Unreliability of Forensic Fingerprinting Evidence Under Daubert*, 14 *Alb. L.J. Sci. & Tech.* 171 (2003); Kristin Roman-detti, Note, *Recognizing and Responding to a Problem with the Admissibility of Fingerprint Evidence Under Daubert*, 45 *Jurimetrics* 41 (2004); Jessica M. Sombat, Note, *Latent Justice: Daubert’s Impact on the Evaluation of Fingerprint Identification Testimony*, 70 *Fordham L. Rev.* 2819 (2002).

[FN71]. E.g., Jennifer L. Mnookin, *Fingerprints: Not a Gold Standard*, *Issues Sci. & Tech.*, Fall 2003, at 47, 47 (“Judge Pollak’s first opinion [restricting latent fingerprint individualization testimony] was the better one.”); Recent Case, United States v. Havvard, 260 F.3d 597 (7th Cir. 2001), 115 *Harv. L. Rev.* 2349, 2352 (2002) (“Fingerprint

expert testimony does not survive application of the Daubert factors..."); Sombat, *supra* note 70, at 2825 (“[T]he result Judge Pollak reached when he excluded expert testimony concerning fingerprints [in Llera Plaza I] was fair.”).

[FN72]. See Sarah Kershaw, *Spain and U.S. at Odds on Mistaken Terror Arrest*, N.Y. Times, June 5, 2004, at A1 (clearing Brandon Mayfield as Spanish authorities matched the fingerprints to an Algerian national); Flynn McRoberts & Maurice Possley, *Report Blasts FBI Lab: Peer Pressure Led to False ID of Madrid Fingerprint*, Chi. Trib., Nov. 14, 2004, at 1.

[FN73]. Professor Cole followed with an article identifying twenty-three cases of documented fingerprint misidentifications. See Simon A. Cole, *More Than Zero: Accounting for Error in Latent Fingerprint Identification*, 95 J. Crim. L. & Criminology 985, 1001-16 (2005). The misidentification cases include some that involved (1) verification by one or more other examiners, (2) examiners certified by the International Association of Identification, (3) procedures using a sixteen-point standard, and (4) defense experts who corroborated misidentifications made by prosecution experts. *Id.* at 1003, 1008, 1010, 1014-15.

[FN74]. See Robert B. Stacey, *A Report on the Erroneous Fingerprint Individualization in the Madrid Train Bombing Case*, 54 J. Forensic Identification 706, 706 (2004).

[FN75]. See Office of the Inspector Gen., U.S. Dep’t of Justice, *A Review of the FBI’s Handling of the Brandon Mayfield Case*, Unclassified Executive Summary 9 (2006).

[FN76]. See Bruce Budowle et al., *Review of the Scientific Basis for Friction Ridge Comparisons as a Means of Identification: Committee Findings and Recommendations*, Forensic Sci. Comm. (Jan. 2006), http://www2.fbi.gov/hq/lab/fsc/backissu/jan2006/research/2006_01_research02.htm.

[FN77]. See *United States v. Hicks*, 389 F.3d 514, 526 (5th Cir. 2004) (“[T]he matching of spent shell casings to the weapon that fired them has been a recognized method of ballistics testing in this circuit for decades.”); *United States v. Foster*, 300 F. Supp. 2d 375, 376 n.1 (D. Md. 2004) (“Ballistics evidence has been accepted in criminal cases for many years.... In the years since Daubert, numerous cases have confirmed the reliability of ballistics identification.”); *United States v. Santiago*, 199 F. Supp. 2d 101, 111 (S.D.N.Y. 2002) (“The Court has not found a single case in this Circuit that would suggest that the entire field of ballistics identification is unreliable.”); *State v. Anderson*, 624 S.E.2d 393, 398 (N.C. Ct. App. 2006) (finding no abuse of discretion in admitting bullet identification evidence); *Commonwealth v. Whitacre*, 878 A.2d 96, 101 (Pa. Super. Ct. 2005) (“[W]e find no abuse of discretion in the trial court’s decision to permit admission of the evidence regarding comparison of the two shell casings with the shotgun owned by Appellant.”).

[FN78]. 405 F. Supp. 2d 104, 109-16 (D. Mass. 2005).

[FN79]. *Id.* at 107. Although the expert had seven years of experience in the field, he was not certified, and his lab was not accredited. Moreover, he had never been formally tested by a neutral proficiency examination. Finally, he could not cite any reliable error rates. *Id.* The expert

conceded, over and over again, that he relied mainly on his subjective judgment. There were no reference materials of any specificity, no national or even local database on which he relied. And although he relied on his past experience with these weapons, he had no notes or pictures memorializing his past observations.

Id.

[FN80]. *Id.* at 108-09 (“I reluctantly come to the above conclusion because of my confidence that any other decision will be rejected by appellate courts, in light of precedents across the country....”).

[FN81]. E.g., *United States v. Hines*, 55 F. Supp. 2d 62, 70-71 (D. Mass. 1999) (admitting expert testimony concern-

ing the general similarities and differences between a defendant's handwriting exemplar and a stick up note, but not the specific conclusion that the defendant was the author).

[FN82]. Green, 405 F. Supp. 2d at 109.

[FN83]. *Id.*

[FN84]. Donald Kennedy, Editorial, *Forensic Science: Oxymoron?*, 302 *Science* 1625, 1625 (2003). *Science* is published by the American Association for the Advancement of Science.

[FN85]. Other commentaries on problems in forensic science soon followed in *Science*. In 2002, Professor Faigman criticized fingerprint evidence in the wake of the *Llera Plaza* decisions. Faigman, *supra* note 38, at 339-40. Professors Cole and Loftus published a letter following the exoneration of Steven Cowan, the first conviction overturned based on DNA profiling in which fingerprint evidence had been crucial in securing the wrongful conviction. Elizabeth F. Loftus & Simon A. Cole, Letter to the Editor, *Contaminated Evidence*, 304 *Science* 959, 959 (2004) (“[F]orensic scientists remain stubbornly unwilling to confront and control the problem of bias, insisting that it can be overcome through sheer force of will and good intentions.”). Professors Saks and Koehler’s article on the paradigm shift appeared next. Saks & Koehler, *supra* note 36.

[FN86]. Donald Kennedy & Richard A. Merrill, *Assessing Forensic Science*, *Issues Sci. & Tech.*, Fall 2003, at 33, 34.

[FN87]. D. Michael Risinger & Michael J. Saks, *A House with No Foundation*, *Issues Sci. & Tech.*, Fall 2003, at 35, 35.

[FN88]. Mhookin, *supra* note 71, at 48-49.

[FN89]. Paul C. Giannelli, *Crime Labs Need Improvement*, *Issues Sci. & Tech.*, Fall 2003, at 55, 55-56.

[FN90]. See *supra* text accompanying note 18.

[FN91]. In 1985, Dr. Alec Jeffreys of the University of Leicester, England, recognized the utility of DNA profiling in criminal cases. Its first use in American courts came the following year. See Office of Tech. Assessment, U.S. Cong., *Genetic Witness: Forensic Uses of DNA Tests* 8 (1990). By January 1990, forensic DNA analysis had been admitted into evidence “in at least 185 cases by 38 States and the U.S. military.” *Id.* at 14. The initial technique, Restriction Fragment Length Polymorphism (RFLP) analysis by gel electrophoresis, was soon supplanted by Polymerase Chain Reaction (PCR)-based methods involving the DQ-alpha locus, “polymarkers,” and the D1S80 locus. These, in turn, were replaced by Short Tandem Repeats, the current procedure. In addition to nuclear DNA analysis, courts have admitted evidence based on mitochondrial DNA (mtDNA) sequencing, as well as DNA analyses of animals, plants, and the HIV virus. See generally 2 Giannelli & Imwinkelried, *supra* note 5, ch. 18 (discussing the scientific and legal basis for DNA profiling).

[FN92]. 545 N.Y.S.2d 985 (N.Y. Sup. Ct. 1989). See generally Jennifer L. Mhookin, *People v. Castro: Challenging the Forensic Use of DNA Evidence*, in *Evidence Stories* 207, 208 (Richard Lempert ed., 2006) (discussing the historical development of DNA evidence use, *Castro*, and the “radical, though perhaps in the end, temporary, shift in the evaluation of DNA evidence” the case caused).

[FN93]. Castro, 545 N.Y.S.2d at 996.

[FN94]. Lander, *supra* note 42, at 504. The FBI's top DNA scientist, Dr. Bruce Budowle, would later acknowledge the shortfalls of DNA evidence when first introduced:

The initial outcry over DNA typing standards concerned laboratory problems: poorly defined rules for declaring a match; experiments without controls; contaminated probes and samples; and sloppy interpretation of autoradiograms. Although there is no evidence that these technical failings resulted in any wrongful convictions, the lack of standards seemed to be a recipe for trouble.

Eric S. Lander & Bruce Budowle, *Commentary, DNA Fingerprinting Dispute Laid to Rest*, 371 *Nature* 735, 735 (1994); see also James D. Watson & Andrew Berry, *DNA: The Secret of Life* 269 (2004) ("Initially, when DNA fingerprinting was done in forensic laboratories without special expertise in handling and analyzing DNA, critical mistakes were not uncommon."). Watson was one of the discoverers of the double helix structure of DNA. See Watson & Berry, *supra*, at xi-xiv.

[FN95]. Jay D. Aronson, *Genetic Witness: Science, Law, and Controversy in the Making of DNA Profiling* 71 (2007). After testifying, Roberts signed the "joint statement" of scientists. See *supra* text accompanying note 94.

[FN96]. See Thompson, *supra* note 39.

[FN97]. John W. Hicks, *Letter to the Editor, DNA Test Proves Itself in Solving Crimes*, *N.Y. Times*, Feb. 21, 1990, at A24.

[FN98]. 129 F.R.D. 629, 630 (N.D. Ohio 1990).

[FN99]. *Id.* at 631.

[FN100]. *Id.* at 635-36; see *Fed. R. Crim. P. 16(a)(1)(D)* (current version at *Fed. R. Crim. P. 16(a)(1)(G)*).

[FN101]. The federal magistrate granted the defense discovery motion based on a different provision of the discovery rule, one that required disclosure of documents and tangible objects that are material to the preparation of the defense. He ruled that "predicate materials" were discoverable under this provision. *Yee*, 129 F.R.D. at 635-36.

Yee was not the only case in which important information was withheld in DNA litigation. Timothy Spencer was the first person executed based on DNA evidence. *Murderer Put to Death in Virginia: First U.S. Execution Based on DNA Tests*, *N.Y. Times*, Apr. 28, 1994, at A19. When the defense sought discovery of the prosecution expert's "work notes," which formed the basis of his report, the motion was denied, and the Virginia Supreme Court upheld this ruling. *Spencer v. Commonwealth*, 384 S.E.2d 785, 791 (Va. 1989). See generally Paul C. Giannelli, *Criminal Discovery, Scientific Evidence, and DNA*, 44 *Vand. L. Rev.* 791, 800-03 (1991) (discussing unjustifiable limitations on discovery).

[FN102]. *United States v. Yee*, 134 F.R.D. 161, 208 (N.D. Ohio 1991), *aff'd sub nom. United States v. Bonds*, 12 F.3d 540 (6th Cir. 1993) (*emphasis added*).

[FN103]. Thompson, *supra* note 39, at 98.

[FN104]. *Yee*, 134 F.R.D. at 210.

[FN105]. Leslie Roberts, *Fight Erupts over DNA Fingerprinting*, 254 *Science* 1721, 1721 (1991).

[FN106]. See Richard C. Lewontin & Daniel L. Hartl, *Population Genetics in Forensic DNA Typing*, 254 *Science* 1745, 1750 (1991). They also wrote: "Appropriately carried out and correctly interpreted, DNA typing is possibly the most powerful innovation in forensics since the development of fingerprinting in the last part of the 19th cen-

ture.” *Id.* at 1746.

[FN107]. See Cases and Commentaries, Prof. Ethics Rep. (Am. Ass’n for the Advancement of Sci. Comm. on Scientific Freedom & Responsibility & Prof’l Soc’y Ethics Grp., D.C.), Spring 1992, at 1, 2 [hereinafter AAAS Ethics Report] (“[T]he normal procedure followed by Science is to publish rebuttals in a subsequent issue and to give the authors of the original article an opportunity to respond.”).

[FN108]. Leslie Roberts, *Science in Court: A Culture Clash*, 257 *Science* 732, 735 (1992). Roberts was a staff writer for *Science*.

[FN109]. See Ranajit Chakraborty & Kenneth K. Kidd, *The Utility of DNA Typing in Forensic Work*, 254 *Science* 1735 (1991).

[FN110]. Roberts, *supra* note 105, at 1721. Lewontin characterized the use of the rebuttal article as “[p]ure politics...I think it is quite extraordinary that an editor would go out and hire two guys to write a rebuttal’ after the article had been peer reviewed and accepted.” Leslie Roberts, *Was Science Fair to Its Authors?*, 254 *Science* 1722, 1722 (1991). Kidd explained: “I felt publishing the article would create a very serious problem in the legal system, and that that was their intent.” *Id.* Koshland defended this position: “I did it to give a more balanced view of the subject. I was trying to be fair.” *Id.*

[FN111]. Robert A. Bever et al., *Letter to the Editor*, 255 *Science* 1050, 1050 (1992).

[FN112]. Lynwood R. Yarbrough, *Letter to the Editor*, 255 *Science* 1052, 1052 (1992); see also Don W. Cleveland, *Letter to the Editor*, 255 *Science* 1052, 1052 (1992) (“[S]urely it is not often that an Editor insists on revisions to the galleys of an article accepted after peer review. Even more remarkable (and all credit no doubt due to the Editor) is to commission a rebuttal to the article and to publish it contemporaneously. Save for an uncritical account filtered through a staff reporter (Leslie Roberts), oddly missing has been direct comment, so often heard on other issues, from the Editor who stands at the center (or more accurately to one side) of the controversy. Having first stirred the pot, where was he when it came time to eat the meal, be it cake or crow?”).

Two years later the controversy was still simmering. Compare Daniel E. Koshland Jr., *Editorial, The DNA Fingerprint Story (Continued)*, 265 *Science* 1015, 1015 (1994) (“This acceptance of the validity of DNA evidence is...a rebuke to the judicial process that has been so slow to accept DNA evidence by failing to see that a couple of outspoken individuals were less representative of the scientific community than the vast majority of careful scholars.”), with Daniel L. Hartl & Richard C. Lewontin, *Letter to the Editor*, 266 *Science* 201, 201 (1994) (“The present editor of *Science* has more than once attempted to nullify our analysis of scientific issues in the forensic use of DNA polymorphism.... Now he has used his privileged access to the editorial column of *Science* to publish an attack of his own....”).

[FN113]. Roberts, *supra* note 108, at 735 (“In a move he would come to regret, Wooley called Hartl in early October 1991 to ‘lobby him’ not to publish the article, which he considered ill-conceived.”); see also Gina Kolata, *Critic of “Genetic Fingerprint” Tests Tells of Pressure to Withdraw Paper*, *N.Y. Times*, Dec. 20, 1991, at A20.

[FN114]. Roberts, *supra* note 108, at 735; see also Peter J. Neufeld, *Have You No Sense of Decency?*, 84 *J. Crim. L. & Criminology* 189, 193 (1993) (“Dr. Hartl ‘had no doubt,’ both ‘from the tone and intensity of his remarks, that Mr. Wooley, on behalf of the FBI and the Department of Justice, was trying to get me to withdraw the article.” (quoting Affidavit of Daniel Hartl at 1-4, *United States v. Yee*, No. 91-3160 (N.D. Ohio Mar. 16, 1992))).

[FN115]. See Aronson, *supra* note 95, at 44 (“Open access to the materials used to conduct DNA testing (especially the probes), as well as the databases used to determine the frequency of a specific allele, would become a major aspect of the controversy over DNA evidence in mid-1989.”).

[FN116]. *State v. Alt*, 504 N.W.2d 38, 48-49 (Minn. Ct. App. 1993) (admitting DNA evidence). Courts had also criticized private DNA labs on this basis. See *State v. Schwartz*, 447 N.W.2d 422, 427-28 (Minn. 1989) (“The validity of testing procedures and principles is assessed in the scientific community by publishing the data in peer review journals.... Efforts to assess the reliability of the commercial laboratories’ methodology consequently have been hindered because this information has not yet been made fully available. For example, Cellmark has not yet published data regarding its methodology and its probes are only selectively available.”). In contrast to the FBI, these enterprises at least have a colorable claim of trade secrets. See Aronson, *supra* note 95, at 77-87 (discussing Schwartz).

[FN117]. Seymour Geisser, *Statistics, Litigation, and Conduct Unbecoming*, in *Statistical Science in the Courtroom* 71, 79 (Joseph L. Gastwirth ed., 2000). According to a NAS report, “[a]n author’s obligation is not only to release data and materials to enable others to verify or replicate published findings...but also to provide them in a form on which other scientists can build with further research.” Nat’l Research Council, *Nat’l Acad. of Scis., Sharing Publication-Related Data and Materials: Responsibilities of Authorship in the Life Sciences* 4 (2003) [hereinafter *NAS Sharing Data Report*].

[FN118]. Geisser, *supra* note 117, at 80.

[FN119]. The editor (Epstein) later wrote that this incident was “sheer coincidence.” AAAS Ethics Report, *supra* note 107, at 4. Chakraborty responded:

I have never discussed this review nor the paper with anyone. I was critical of the manuscript, because I believed that it was unprofessionally written, it contained several fatal errors, and it only reported parts of unpublished data from other laboratories without appropriate credit or consent of the data gatherers.

Id. The paper was subsequently published. See Seymour Geisser & Wesley Johnson, *Testing Hardy-Weinberg Equilibrium on Allelic Data from VNTR Loci*, 51 *Am. J. Hum. Genetics* 1084 (1992).

[FN120]. See *supra* text accompanying note 108.

[FN121]. AAAS Ethics Report, *supra* note 107, at 5. Epstein, editor of *American Journal of Human Genetics*, wrote that his journal had “served as an open forum on the forensic uses of DNA technology. We have published highly ‘partisan’ but nevertheless carefully reviewed papers on all sides of the issue.” *Id.*

[FN122]. Chakraborty explained: “My co-investigatorship in a NIH grant had no connection with my reviewing this manuscript, and my review was to the point of evaluating a ‘scientific manuscript on its scientific merit.’” *Id.* at 4.

[FN123]. Geisser, *supra* note 117, at 81.

[FN124]. *Id.* at 82.

[FN125]. Christopher Anderson, *FBI Attaches Strings to Its DNA Database*, 357 *Nature* 618, 618 (1992) (quoting part of letter).

Kearney says that the FBI is “not quite sure of [Geisser’s] intent” in seeking to analyze the data, pointing out that Geisser has testified for the defence.... Kearney acknowledged that the FBI has provided the data to other researchers... at least two of whom have testified for the prosecution....

Id.

[FN126]. AAAS Ethics Report, *supra* note 107, at 6.

[FN127]. Thomas O. McGarity & Wendy E. Wagner, *Bending Science: How Special Interests Corrupt Public*

Health Research 96 (2008) (listing examples of the “funding effect”).

[FN128]. Justin E. Bekelman et al., *Scope and Impact of Financial Conflicts of Interest in Biomedical Research: A Systematic Review*, 289 *J. Am. Med. Ass'n.* 454, 463 (2003).

[FN129]. *NAS DNA Report I*, supra note 40, at 1-2. A second committee was formed after some aspects of the first report were severely criticized. *NAS DNA Report II*, supra note 40, at v-vi.

[FN130]. See AAAS Ethics Report, supra note 107, at 7 (statement of Barry Scheck) (“Hicks subsequently wrote an unsolicited reply that NAS staff say they did not distribute to the Committee.”); Celia Hooper, *Rancor Precedes National Academy of Science's DNA Fingerprinting Report*, *J. NIH Res.*, Mar. 1992, at 76, 79 (“Hicks says that...two members of the NAS committee gave him copies of a preliminary draft of the report.”); see also Shannon Brownlee, *Courtroom Genetics: A Flap over DNA Evidence Raises Questions About the Relationship of Science to the Law*, *U.S. News & World Rep.*, Jan. 27, 1992, at 60, 61 (“Hicks told U.S. News that two panel members, who were unhappy with the panel's conclusions, sent him a draft....”).

[FN131]. The NAS officials refused to pass on the FBI's objections to the committee. Hooper, supra note 130, at 80.

[FN132]. The issue had arisen at the time of the Science affair. Yarbrough's letter to the editor noted:

The vehemence and lack of scientific objectivity that appear to surround this issue indicate that there may be important concerns other than scientific ones. I urge that Science obtain from those most closely involved in this debate information about possible economic interests in DNA typing and provide this information to the reader, as other journals have sometimes done.

Yarbrough, supra note 112, at 1052; see also Rorie Sherman, *DNA Is on Trial Yet Again*, *Nat'l L.J.*, Mar. 16, 1992, at 1 (discussing conflicts of interest).

[FN133]. See Christopher Anderson, *Conflict Concerns Disrupt Panels, Cloud Testimony*, 355 *Nature* 753, 753-54 (1992) (reporting Caskey's resignation from several panels including the NAS Committee); Christopher Anderson, *DNA Fingerprinting Discord*, 354 *Nature* 500, 500 (1991) (“Caskey is a prominent supporter of DNA fingerprinting who licenses his techniques to Cellmark Diagnostics, one of the largest DNA fingerprinting companies.”); see also Aronson, supra note 95, at 159 (discussing Caskey's resignation from the NAS Committee).

[FN134]. McGarity & Wagner, supra note 127, at 173.

[FN135]. 646 A.2d 431 (N.J. Super. Ct. App. Div. 1994) (per curiam).

[FN136]. A former prosecutor would later write that Blake was “a noted forensic serologist, [who] had become a pioneer in the use of PCR testing in criminal cases” and that “prosecutors and defense attorneys alike enlisted Blake for testing and advice.” George “Woody” Clarke, *Justice and Science: Trials and Triumphs of DNA Evidence* 41-42 (2007).

[FN137]. DeMarco, 646 A.2d at 436-37; see also Kolata, supra note 113, at A20 (“When Dr. Ford testified..., the prosecutors obtained a court order to examine his laboratory and all papers in it.”).

[FN138]. See Leslie Roberts, *Prosecutor v. Scientist: A Cat-and-Mouse Relationship*, 257 *Science* 733, 733 (1992) (noting “an unofficial network of prosecutors and the FBI”).

[FN139]. Kolata, supra note 113, at A20.

[FN140]. Roberts, *supra* note 138, at 733; see also Neufeld, *supra* note 114, at 192-93 (“Harmon wrote to the editors of *Science* in an attempt to thwart the publication of Mueller’s paper. In his letter to *Science*, written on official government letterhead, Harmon...derided Dr. Mueller’s technical criticisms as ‘knuckle-headed,’ suggested that the doctor was unethical, and cautioned the editors that publication ‘could conceivably result in a vicious, violent criminal being freed to continue to prey on society.’”). Harmon’s letter worked.

[FN141]. See Kolata, *supra* note 113, at A20 (“[Dr. Ford] said an F.B.I. lawyer asked him about the status of his visa status during cross-examination...last year.”).

[FN142]. Geisser, *supra* note 117, at 84. Libby was a defense expert in the 1994 trial of Bradley Cunningham for the murder of his wife. Cunningham was representing himself. John Hunt, Cunningham’s standby attorney (advisor), was also indicted along with Libby. The charge of false swearing arose from Libby’s affidavit in the support of a mistrial motion, in which Libby asserted that he had not been allowed to talk to the defendant in jail in order to prepare to testify. Jail officials said that arrangements would have been made if Libby and Hunt had so requested. Yet John Junkin, the county counsel, testified at the trial “that he and the jail commander had issued a policy prohibiting Cunningham from meeting privately with anyone except his advisers and investigator. Junkin said a court order would have been necessary for Cunningham to meet with an expert witness, such as Libby.” Elvia Diaz, Expert Witness, Attorney Acquitted, *Oregonian*, Aug. 13, 1996, at B02. Incredibly, Libby was also charged with tampering with physical evidence—signing the affidavit. See also Don Hamilton, Forensic Expert Sues County’s District Attorney, *Oregonian*, May 9, 1997, at C02.

[FN143]. Geisser, *supra* note 117, at 84.

[FN144]. One prosecutor referred to a defense expert as espousing “knuckle-headed ideas.” Roberts, *supra* note 138, at 733 (quoting Rockne Harmon). Another referred to a different expert’s views as “ill-conceived.” Roberts, *supra* note 108, at 735 (discussing James Wooley’s views).

[FN145]. See Paul C. Giannelli, *The Admissibility of Novel Scientific Evidence: Frye v. United States, a Half-Century Later*, 80 *Colum. L. Rev.* 1197, 1224-25 (1980) (discussing the history of the paraffin test).

[FN146]. Nat’l Research Council, Nat’l Acad. of Scis., *On the Theory and Practice of Voice Identification* 1-2, 45 (1979) [hereinafter *NAS Voice ID Report*]; see also I Giannelli & Imwinkelried, *supra* note 5, ch. 10 (discussing the voiceprint developments).

[FN147]. See Symposium on Science and the Rules of Evidence, 99 *F.R.D.* 187, 233 (1983) (statement of Margaret Berger) (noting “the lack of scientific literacy” of lawyers).

[FN148]. Adversarial pressure on experts is so common that the ABA felt compelled to issue a standard in an attempt to address the problem. ABA Criminal Justice Standard 3-3.3(a) provides: “A prosecutor who engages an expert for an opinion should respect the independence of the expert and should not seek to dictate the formation of the expert’s opinion on the subject.” Standards for Criminal Justice Prosecution Function & Def. Function §3-3.3(a) (3d ed. 1993). The accompanying commentary states:

Statements made by physicians, psychiatrists, and other experts about their experiences as witnesses in criminal cases indicate the need for circumspection on the part of prosecutors who engage experts. Nothing should be done by a prosecutor to cast suspicion on the process of justice by suggesting that the expert color an opinion to favor the interests of the prosecutor.

Id. §3-3.3 *cm.* at 59. A comparable Standard applies to defense counsel. *Id.* §4-4.4(a).

[FN149]. E.g., Leslie Roberts, *Hired Guns or True Believers?*, 257 *Science* 735, 735 (1992) [hereinafter Roberts, *Hired Guns*] (reporting that another expert received more than \$60,000 for testifying once a month for several

years); Roberts, *supra* note 108, at 734 (noting that one prosecutor complained that an expert was paid \$28,000 for four-month preparation and trial testimony).

[FN150]. Roberts, *Hired Guns*, *supra* note 149, at 735 (“[One prosecution witness] appeared 14 times in the past year and a half, bringing in \$3,000 to \$4,000 a case.... In fact, witnesses on both sides charge roughly the same amount—\$150 or \$200 an hour, and perhaps \$1,000 a day if they are out of town, plus expenses.”).

[FN151]. See Aronson, *supra* note 95, at 111 (“In addition to receiving substantial fees for testifying on behalf of the prosecution, members of this group also received significant grants from the National Institute of Justice....”).

[FN152]. As Judge Weinstein has noted, “[c]ourts, as gatekeepers, must be aware of how difficult it can be for some parties—particularly indigent criminal defendants—to obtain an expert to testify. The fact that one side may lack adequate resources with which to fully develop its case is a constant problem.” Jack B. Weinstein, *Science, and the Challenges of Expert Testimony in the Courtroom*, 77 *Or. L. Rev.* 1005, 1008 (1998).

[FN153]. A survey of approximately three hundred crime laboratories revealed that “[f]ifty-seven percent...would only examine evidence submitted by law enforcement officials.” Joseph L. Peterson et al., *The Capabilities, Uses, and Effects of the Nation's Criminalistics Laboratories*, 30 *J. Forensic Sci.* 10, 13 (1985); see also President's Comm'n on Law Enforcement & Admin. of Justice, *The Challenge of Crime in a Free Society* 255 (1967) (“[Crime laboratories are] the oldest and strongest link between science and technology and criminal justice.”).

The FBI Laboratory, the largest publicly funded forensic laboratory in the country, had 585 full-time employees as of January 2004. The new FBI Lab at Quantico, Virginia, cost over \$150 million. Joseph L. Peterson & Matthew J. Hickman, *Census of Publicly Funded Forensic Crime Laboratories, 2002*, in *Bureau of Justice Statistics Bulletin* 11 (U.S. Dep't of Justice, NCJ 207205, Feb. 2005). See generally David Fisher, *Hard Evidence: How Detectives Inside the FBI's Sci-Crime Lab Have Helped Solve America's Toughest Cases* (1995) (discussing the FBI Lab's successes); The History Channel, *Modern Marvels: FBI's Crime Lab* (2004) (documentary).

[FN154]. “It is quite common to find FBI or other federal experts testifying in state criminal proceedings about a diverse array of forensic procedures, including the analysis of drugs, blood, hair, fibers, firearms, fingerprints, gunshot residues, shoeprints, voice comparisons, and the like.” Giannelli, *supra* note 23, at 1329-30 (footnotes omitted).

[FN155]. For example, the services of the FBI Laboratory are available without charge to all police departments. See 28 C.F.R. § 0.85(g) (2009) (“[The FBI Laboratory is] to provide, without cost, technical and scientific assistance...for all duly constituted law enforcement agencies,...which may desire to avail themselves of the service.”).

[FN156]. See *Kowalski v. Tesmer*, 543 U.S. 125, 140 (2004) (Ginsburg, J., dissenting) (“According to the Department of Justice, approximately eight out of ten state felony defendants use court-appointed lawyers.”); Yale Kamisar et al., *Modern Criminal Procedure* 22-23 (10th ed. 2002) (“A sampling of felony defendants in the 75 largest counties indicated that approximately 80% receive court appointed attorneys.”).

[FN157]. 470 U.S. 68, 83-84 (1985).

[FN158]. In 1990, the *National Law Journal* published the results of a six-month investigation of the defenses of capital murders in the South. One of the “key findings” concerned defense experts: “Judges routinely deny lawyers' requests for expert/investigative fees.” Marcia Coyle et al., *Fatal Defense: Trial and Error in the Nation's Death Belt*, *Nat'l L.J.*, June 11, 1990, at 30, 30. As part of this investigation, sixty death row trial lawyers were interviewed—“54.2% felt [the] court provided inadequate investigation and expert funds.” *Id.* at 40. One attorney, who was appointed to represent a death row inmate in Georgia, had his request for the appointment of an expert denied. He commented: “There's an economic presumption of guilt.... The district attorney has all the resources of the state crime lab, and we have to go hat in hand to the judge and the DA on every request.” *Id.* at 38.

In addition, a 1993 report commissioned by the Texas Bar Association concluded that “[t]here is a serious underfunding of essential expert services and other expenses in capital trials and appeals.” The Spangenberg Group, *A Study of Representation in Capital Cases in Texas*, 56 *Tex. B.J.* 333, 408 (1993).

[FN159]. Roger A. Hanson et al., *Nat’l Ctr. for State Courts, Indigent Defenders: Get the Job Done and Done Well* 100 (1992).

[FN160]. Neil Vidmar & Valerie P. Hans, *American Juries: The Verdict* 173 (2007). In their landmark 1966 jury study, Kalven and Zeisel commented: “Again, the imbalance between prosecution and defense appears. In 22 per cent of the cases the prosecution has the only expert witness, whereas in only 3 per cent of the cases does the defense have such an advantage.” Harry Kalven, Jr. & Hans Zeisel, *The American Jury* 139 (1966).

[FN161]. “Defense counsel must have access to adequate expert assistance, even when the admissibility of the results of analytical techniques is not in question, because there is still a need to review the quality of the laboratory work and the interpretation of the results.” *NAS DNA Report I*, supra note 40, at 147. “Because of the potential power of DNA evidence, authorities must make funds available to pay for expert witnesses....” *Id.* at 149. A British study came to the same conclusion: “Legal Aid should be granted automatically for one expert assessment of the prosecution work. DNA evidence should only be admissible where an appropriate expert is available to the defence.” Beverley Steventon, *Royal Comm’n on Criminal Justice, The Ability to Challenge DNA Evidence*, Research Study No. 9, at 44 (1993). According to the President’s DNA Initiative, “Even if DNA evidence is admitted, there still may be disagreement about its interpretation—what do the DNA results mean in a particular case?” *Nat’l Inst. of Justice, President’s DNA Initiative: Principles of Forensic DNA for Officers of the Court* (U.S. Department of Justice CD-ROM, NCJ 212399).

[FN162]. *NAS DNA Report I*, supra note 40, at 93. The Report further commented: “Because the application of DNA typing in forensic science is to be used in the service of justice, it is especially important for society to establish mechanisms for accountability and to ensure appropriate public scrutiny.” *Id.* at 162.

[FN163]. *Id.* at 94.

[FN164]. Mike Redmayne, *Expert Evidence and Criminal Justice* 204 (2001); see also Aronson, supra note 95, at 3-4 (“As a result of defense challenges, scientists were forced to go back to their laboratories and professional societies to develop more robust methods and protocols, better quality control mechanisms, and more effective, inclusive peer review systems.”).

[FN165]. Ian W. Evett & Bruce S. Weir, *Interpreting DNA Evidence: Statistical Genetics for Forensic Scientists* xiv (1998); see also Richard Lempert, *Comment: Theory and Practice in DNA Fingerprinting*, 9 *Stat. Sci.* 255, 258 (1994) (“[I]n this instance the importation of legal adversariness into the scientific world has spurred both valuable research and practical improvements in the way DNA evidence is analyzed and presented.”); Mhookin, supra note 41, at 70 (“[W]hile it is easy to disparage ‘battles of the experts’ as expensive, misleading, and confusing to the fact-finder, these battles may also reveal genuine weaknesses in proffered expert knowledge.”).

[FN166]. See supra notes 59-71 and accompanying text.

[FN167]. *United States v. Havvard*, 117 *F. Supp. 2d* 848, 854 (S.D. Ind. 2000), *aff’d*, 260 *F.3d* 597 (7th Cir. 2001).

[FN168]. 365 *F.3d* 215, 219 (3d Cir. 2004).

[FN169]. Epstein, supra note 70, at 629. Epstein was the defense counsel in Mitchell.

[FNI70]. *Id.* at 629 n.132 (emphasis added) (quoting FBI letter). According to Epstein,

[t]he FBI was so unhappy with the results of this experiment that it sent the nine agencies in question a new response form.... This time, however, the FBI took nothing for granted. The FBI provided the agencies with the marked-up enlargements of the fingerprints displaying what the FBI apparently believed to be the common characteristics.

Id.

[FNI71]. E.g., United States v. Hernandez, 299 F.3d 984, 991 (8th Cir. 2002); United States v. Prime, 220 F. Supp. 2d 1203, 1210 (W.D. Wash. 2002).

[FNI72]. E.g., David H. Kaye, Questioning a Courtroom Proof of the Uniqueness of Fingerprints, 71 *Int'l Stat. Rev.* 521, 526-28 (2003); Sharath Pankanti et al., On the Individuality of Fingerprints, 24 *IEEE Transactions on Pattern Analysis & Machine Intelligence* 1010, 1024 (2002).

[FNI73]. Kaye, *supra* note 172, at 527-28. In another passage, he wrote: "the study merely demonstrates the trivial fact that the same two-dimensional representation of the surface of a finger is far more similar to itself than to such a representation of the surface of a finger from any other person in the data set." *Id.* at 527.

[FNI74]. Professor Kaye also made the following observations: "The sampling procedure was not described beyond the observation that 'database retrieval software' selected 'the first 50,000 left loop records.'" *Id.* at 524. "The report gives no explanation of the algorithms or how they differ." *Id.* at 524-25. "The report does not describe these distributions. No values for the means and standard deviations are provided." *Id.* at 525. "[T]he probabilities...are too small, making the demonstration of uniqueness seem stronger than it is." *Id.* at 526.

[FNI75]. Llera Plaza II, 188 F. Supp. 2d 549, 558 (E.D. Pa. 2002).

[FNI76]. *Id.* at 565.

[FNI77]. See Stacey, *supra* note 74, at 716 ("Verifiers should be given challenging exclusions during blind proficiency tests to ensure that they are independently applying ACE-V methodology correctly...."); see also United States v. Crisp, 324 F.3d 261, 274 (4th Cir. 2003) (Michael, J., dissenting) ("Proficiency testing is typically based on a study of prints that are far superior to those usually retrieved from a crime scene."); Jennifer L. Mnookin, Op-Ed., A Blow to the Credibility of Fingerprint Evidence, *Boston Globe*, Feb. 2, 2004, at A15 ("There are no systematic proficiency tests to evaluate examiners' skill. Those tests that exist are not routinely used and are substandard.").

[FNI78]. Nat'l Inst. of Justice, U.S. Dep't of Justice, Solicitation: Forensic Friction Ridge (Fingerprint) Examination Validation Studies 3 (2000).

[FNI79]. See Epstein, *supra* note 70, at 628 n.122 ("Internal documents of the NIJ presently on file with the author...reveal that the Institute was ready to publish the Solicitation in September of 1999, but that at the FBI's request, publication was delayed until after Mitchell's trial.").

[FNI80]. United States v. Mitchell, 365 F.3d 215, 255 (3d Cir. 2004); see also *id.* at 232.

[Mitchell's] most damaging evidence came from Dr. Richard Rau of the NIJ, who coordinated the drafting of the solicitation. Rau testified to conversations at a September 1999 meeting among himself, Donald Kerr (the Assistant Director of the FBI in charge of the FBI crime laboratory), David Boyd (the Deputy Director of the NIJ), and others. Rau claimed that at that meeting Kerr and Boyd agreed to withhold release of the solicitation until the end of Mitchell's trial. In response to Dr. Rau's testimony, the government called Kerr, Boyd, and the other individuals at the meeting to testify that Dr. Rau's account of the delay in releasing the solicitation was incorrect and that the

delay was caused by budgetary issues.

Id.

[FN181]. See *supra* text accompanying notes 84-85.

[FN182]. Kennedy, *supra* note 84, at 1625.

[FN183]. See Budowle et al., *supra* note 76; *supra* text accompanying notes 72-76.

[FN184]. Stacey, *supra* note 74, at 713.

[FN185]. See generally Erik Randich & Patrick M. Grant, Proper Assessment of the JFK Assassination **Bullet Lead** Evidence from Metallurgical and Statistical Perspectives, 51 J. Forensic Sci. 717 (2006) (discussing the original analysis of the **bullet** fragments).

[FN186]. Nat'l Research Council, Nat'l Acad. of Scis., Forensic **Analysis: Weighing Bullet Lead** Evidence 1-2, 15 (2004) [hereinafter NAS CBLA Report]. The author served on the NAS Committee.

[FN187]. *Id.* at 2.

[FN188]. See Edward J. Imwinkelried & William A. Tobin, **Comparative Bullet Lead Analysis (CBLA) Evidence: Valid Inference or Ipse Dixit?**, 28 Okla. City U. L. Rev. 43, 44-46 (2003); Erik Randich et al., A Metallurgical Review of the Interpretation of **Bullet Lead Compositional Analysis**, 127 Forensic Sci. Int'l 174, 174-76 (2002) (Tobin was a co-author); William A. Tobin & Wayne Duerfeldt, How Probative Is **Comparative Bullet Lead Analysis?**, Crim. Just., Fall 2002, at 26, 27. In 2003, a federal district court excluded CBLA evidence under the Daubert standard, the first case to do so. United States v. Mikos, No. 02 CR 137, 2003 WL 22922197, at *6 (N.D. Ill. Dec. 9, 2003).

[FN189]. E.g., Ragland v. Commonwealth, 191 S.W.3d 569, 577 (Ky. 2006); Clemons v. State, 896 A.2d 1059, 1068-70 (Md. 2006); State v. Behn, 868 A.2d 329, 339-42 (N.J. Super. Ct. App. Div. 2005) (Tobin's affidavit submitted).

[FN190]. In Ragland, 191 S.W.3d at 580, a Kentucky murder case, an FBI examiner, Kathleen Lundy, lied during an admissibility hearing. She "blamed her conduct partly on a sense of crisis in her work, fed by 'new and repeated challenges to the validity of the science associated with bullet lead comparison analysis.'" Charles Piller & Robin Mejia, Science Casts Doubt on FBI's Bullet Evidence, L.A. Times, Feb. 3, 2003, at A1. Lundy subsequently admitted to her superiors that she had lied, and on June 17, 2003, she pleaded guilty to testifying falsely and was sentenced to a suspended ninety-day jail sentence and a \$250 fine. Mark Pitsch, Ex-FBI Scientist Pleads Guilty, Courier-Journal, June 18, 2003, at 1B; see also Associated Press, Prosecutors Challenged in Ragland Murder Case, Ky. Post, Sept. 6, 2002, at A13 ("Attorneys for both sides were in court for a hearing in which FBI ballistics expert Kathleen Lundy was scheduled to testify about lying during a preliminary hearing in Shane Ragland's murder case."); Maurice Possley, Study Shoots Holes in Bullet Analyses by FBI, Chi. Trib., Feb. 11, 2004, at C14.

[FN191]. NAS CBLA Report, *supra* note 186, at iv, 5-6. The remainder of this Section, *infra* notes 192-200 and accompanying text, are amplified in the National Academy of Sciences' report, Forensic **Analysis: Weighing Bullet Lead Evidence**, which the author co-authored, and other previous articles published by the author. See *id.* at 91-93; Giannelli, *supra* note 45, at 198-203.

[FN192]. E.g., Wilkerson v. State, 776 A.2d 685, 689 (Md. Ct. Spec. App. 2001).

[FN193]. E.g., State v. Krummacher, 523 P.2d 1009, 1012 (Or. 1974).

[FN194]. E.g., United States v. Davis, 103 F.3d 660, 673-74 (8th Cir. 1996); People v. Lane, 628 N.E.2d 682, 689-90 (Ill. App. Ct. 1993).

[FN195]. See Jones v. State, 425 N.E.2d 128, 131 (Ind. 1981); State v. Strain, 885 P.2d 810, 817 (Utah Ct. App. 1994).

[FN196]. See State v. Grube, 883 P.2d 1069, 1078 (Idaho 1994); People v. Johnson, 499 N.E.2d 1355, 1366 (Ill. 1986).

[FN197]. See State v. Reynolds, 297 S.E.2d 532, 534 (N.C. 1982).

[FN198]. Bryan v. State, 935 P.2d 338, 360 (Okla. Crim. App. 1997).

[FN199]. See Davis, 103 F.3d at 666 (“An expert testified that such a finding is rare and that the bullets must have come from the same box or from another box that would have been made by the same company on the same day.”); Commonwealth v. Daye, 587 N.E.2d 194, 207 (Mass. 1992); State v. King, 546 S.E.2d 575, 584 (N.C. 2001) (“Ms. Lundy opined that, based on her lead analysis, the bullets she examined either came from the same box of cartridges or came from different boxes of the same caliber, manufactured at the same time.”).

[FN200]. An early case reported that the specimens “had come from the same batch of ammunition: they had been made by the same manufacturer on the same day and at the same hour.” Brown v. State, 601 P.2d 221, 224 (Alaska 1979) (emphasis added). In another case, the expert “opined that the same company produced the bullets at the same time, using the same lead source. Based upon Department of Justice records, she opined that an overseas company called PMC produced the bullets around 1982.” People v. Villarta, No. H021354, 2002 WL 66887, at *6 (Cal. Ct. App. Jan. 17, 2002). One case reports the expert's conclusion with a statistic. Earhart v. State, 823 S.W.2d 607, 614 (Tex. Crim. App. 1991). In recent years, the testimony became more limited. A 2002 FBI publication stated the conclusion as follows: “Therefore, they likely originated from the same manufacturer's source (melt) of lead.” Charles A. Peters, The Basis for Compositional Bullet Lead Comparisons, *Forensic Sci. Comm.* (July 2002), <http://www2.fbi.gov/hq/lab/fsc/backissu/july2002/peters.htm> (emphasis added).

[FN201]. NAS CBLA Report, *supra* note 186, at 7.

[FN202]. See Clifford H. Spiegelman & Karen Kafadar, Data Integrity and the Scientific Method: The Case of Bullet Lead Data as Forensic Evidence, *Chance*, June 2006, at 17, 22.

[FN203]. *Id.*

[FN204]. *Id.* (“During the open sessions of the committee meetings, the FBI claimed to have a ‘complete data file’ of some 71,000+ measurements. Following repeated requests from the committee, the FBI submitted at its last meeting a CD-ROM that contained two data files with a combined total of 64,869 **bullet** (not 71,000+) measurement records. This dataset could not be analyzed in time for the release of the report...”).

[FN205]. *Id.*

[FN206]. *Id.* “[T]he numbering system of the **bullets** was highly inconsistent and rather unexpected (e.g., the **bullets** from a suspect in a particular case might be numbered Q13A, Q13B, Q13C, Q14A, Q14B, Q14C, ..., **leading** one to

wonder what happened to **bullets** Q01, Q02,...,Q12)." Id. Other illustrations of incomplete data were noted: "while most of the **bullets** indicated three measurements, about 30 **bullets** had six or more measurements." Id.

[O]nly about 50% of the **bullets** in this dataset were identified as having come from one of the four major **bullet** manufacturers in the United States [(Cascade Cartridge, Inc., or CCI; Federal; Remington; and Winchester)]; the "complete data file" of 71,000 **bullets** may yield a higher proportion of **bullets** from these four manufacturers.

Id. at 18-19, 22.

[FN207]. Id. at 22.

[FN208]. Id.

[FN209]. Id.

[FN210]. Id. at 24.

[FN211]. See Giannelli, *supra* note 45, at 198-203 (discussing CBLA).

[FN212]. 823 S.W.2d 607, 614 (Tex. Crim. App. 1991) ("[The expert] concluded that the likelihood that two .22 caliber bullets came from the same batch, based on all the .22 bullets made in one year, is approximately .000025 percent, 'give or take a zero.' [The expert] subsequently acknowledged, however, that the numbers which he used to reach the .000025 percent statistic failed to take into account that there are different types of .22 caliber bullets made each year....").

[FN213]. See *Earhart v. Johnson*, 132 F.3d 1062, 1067 (5th Cir. 1998) (denying habeas relief) ("Given the significant role the bullet evidence played in the prosecution's case, we shall therefore assume Earhart could have made a sufficient threshold showing that he was entitled to a defense expert under Texas law.").

[FN214]. Statement of Facts: Trial at 5248-49, *State v. Earhart*, No. 4064 (Tex. D. Apr. 21, 1989) (testimony of John Riley); see also *id.* at 5258 ("Well, bullets that are...analytically indistinguishable compositions... typically are found within the same box of ammunition and that is the case that we have here. Now, bullets that are the same composition can also be found in other boxes of ammunition, but it's most likely those boxes would have been manufactured at the same place on or about the same date."). A different FBI examiner took a different position in another case. See Transcript of Record at 1-2, *Commonwealth v. Wilcox* (Ky. Feb. 28, 2002) (Daubert hearing; testimony of Charles A. Peters, FBI examiner) ("We have never testified, to my knowledge, that that bullet came from that box. We'd never say that. All we are testifying is that that bullet, or that victim fragment or something, the bullet, either came from that box or the many boxes that were produced at the same time." (emphasis added)).

[FN215]. NAS CBLA Report, *supra* note 186, at 6.

[FN216]. See Death Penalty Info. Ctr., Searchable Execution Database, [DeathPenaltyInfo.org](http://www.deathpenaltyinfo.org), <http://www.deathpenaltyinfo.org/executions> (search "Earhart" under "Search by Name" search box) (last visited Nov. 9, 2010).

[FN217]. Press Release, Fed. Bureau of Investigation, National Academy of Sciences Releases FBI-Commissioned Study on **Bullet Lead Analysis** (Feb. 10, 2004), available at <http://www.fbi.gov/news/pressrel/press-releases/national-academy-of-sciences-releases-fbi-commissioned-study-on-bullet-lead-analysis>.

[FN218]. Id.

[FN219]. Possley, *supra* note 190, at C14.

[FN220]. Charles Piller, Report Finds Flaws in FBI **Bullet Analysis**: Changes Are Proposed for the Technique Often Cited in Expert Testimony in Criminal Trials, *L.A. Times*, Feb. 11, 2004, at A12.

[FN221]. Randolph E. Schmid, Panel Questions FBI **Bullet Analysis**, *Nat'l Whistleblowers Ctr.*, <http://www.whistleblowers.org/index.php?option=content&task=view&id=269> (last visited Nov. 9, 2010).

[FN222]. Eric Lichtblau, Report Questions the Reliability of an F.B.I. Ballistics Test, *N.Y. Times*, Feb. 11, 2004, at A22.

[FN223]. Press Release, Fed. Bureau of Investigation, *supra* note 217.

[FN224]. NAS CBLA Report, *supra* note 186, at 100.

[FN225]. Eric Lichtblau, F.B.I. Abandons Disputed Test for Bullets from Crime Scenes, *N.Y. Times*, Sept. 2, 2005, at A12.

[FN226]. Press Release, Fed. Bureau of Investigation, FBI Laboratory Announces Discontinuation of Bullet Lead Examinations (Sept. 1, 2005), available at http://www2.fbi.gov/pressrel/pressrel05/bullet_lead_analysis.htm (search "Discontinuation of Bullet Lead Examinations" in search box).

[FN227]. John Solomon, FBI Forensic Test Full of Holes, *Wash. Post*, Nov. 18, 2007, at A1.

[FN228]. See *Ragland v. Commonwealth*, 191 S.W.3d 569, 580 (Ky. 2006) ("If the FBI Laboratory that produced the CBLA evidence now considers such evidence to be of insufficient reliability to justify continuing to produce it, a finding by the trial court that the evidence is both scientifically reliable and relevant would be clearly erroneous..."); *Clemons v. State*, 896 A.2d 1059, 1070, 1078 (Md. 2006) ("CBLA is not admissible under the Frye-Reed standard because it is not generally accepted within the scientific community as valid and reliable....Based on the criticism of the processes and assumptions underlying CBLA, we determine that the trial court erred in admitting expert testimony based on CBLA because of the lack of general acceptance of the process in the scientific community."); *State v. Behn*, 868 A.2d 329, 331 (N.J. Super. Ct. App. Div. 2005) (finding the technique was "based on erroneous scientific foundations"). But see *United States v. Davis*, 406 F.3d 505, 509 (8th Cir. 2005) ("Davis's trial counsel cannot be said to be ineffective for failing to challenge the FBI's methodology on a basis that was not advanced by the scientific community at the time of trial."); *Commonwealth v. Fisher*, 870 A.2d 864, 871 (Pa. 2005) ("The CBLA evidence, at best, established a possible connection between Appellant and the bullets recovered from the victim's body.").

[FN229]. Solomon, *supra* note 227 (quoting Ken MacFadden).

[FN230]. *Id.*; see also *supra* text accompanying note 215 (quoting NAS CBLA Report).

[FN231]. 60 Minutes: Evidence of Injustice (CBS television broadcast Nov. 18, 2007).

[FN232]. *Id.*

[FN233]. Solomon, *supra* note 227.

[FN234]. *Id.* at A1 ("Hundreds of defendants sitting in prisons nationwide have been convicted with the help of an

FBI forensic tool that was discarded more than two years ago. But the FBI lab has yet to take steps to alert the affected defendants or courts, even as the window for appealing convictions is closing....”).

[FN235]. The Innocence Network and the National Association of Criminal Defense Lawyers have formed a task force and are working with the FBI to contact defense attorneys and convicts. See Vesna Jaksic, *Faulty Bullet-Test Cases Finding Way to Court*, Nat'l L.J., Feb. 25, 2008 (“The task force is lining up pro bono commitments from several law firms to handle the cases.”).

[FN236]. John Solomon, *Leahy Pursues Forensic-Test Answers: Attorney General Is Told to Prepare for Senate Inquiry*, Wash. Post, Nov. 22, 2007, at A2 (quoting Senator Leahy). Leahy also wrote:

The new revelations about bullet-lead analysis are just the latest examples of the Department's inadequate efforts to ensure that sound forensic testing is utilized to the maximum extent to find the guilty rather than merely obtain a conviction. Punishing the innocent is wrong and allows the guilty party to remain free.

Id.

[FN237]. See *supra* note 2.

[FN238]. As one article reported:

Donald Kennedy, a Stanford scientist who helped select the report's authors, said federal law enforcement agencies resented “intervention” of mainstream science—especially the National Academy—in the courts.

He said the National Institute of Justice...tried to derail the forensic study by refusing to finance it and demanding to review the findings before publication.

Solomon Moore, *Science Found Wanting in Nation's Crime Labs*, N.Y. Times, Feb. 5, 2009, at A1.

[FN239]. *Fiscal 2009 Appropriations: Commerce, Justice and Science Before the Subcomm. on Commerce, Justice, Sci. & Related Agencies of the S. Comm. on Appropriations, 110th Cong. (2008)* (statement of Sen. Richard Shelby, Ranking Member, Subcomm. on Commerce, Justice, Sci. & Related Agencies), available at http://src.senate.gov/public/_files/radio/shelby4_10_08.mp3.

[FN240]. Id. (“On December the 17th and 18th of this past year, the Deputy Director of [NIJ] even convened a counterproductive forensics summit here in Washington. Many of the attendees deemed the summit a huge waste of more than \$300,000 in taxpayer's funds.”).

[FN241]. Id. (“I am not so sure the seriousness of this matter has the full attention of the leadership at the [DOJ]. I hope and encourage you to check into this matter.”).

[FN242]. Moore, *supra* note 238.

[FN243]. See *supra* text accompanying notes 48-49.

[FN244]. Hempel, *supra* note 49, at 49.

[FN245]. Popper, *supra* note 49, at 37 (emphasis omitted).

[FN246]. Brief of the New England Journal of Med. et al. as Amici Curiae Supporting Respondents at 2, *Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579 (1993) (No. 92-102). Peer review's “role is to promote the publication of well-conceived articles so that the most important review, the consideration of the reported results by the scientific community, may occur after publication.” Id. at 3.

[FN247]. NAS Forensics Report, *supra* note 2, at 15.

[FN248]. *Id.* at 8. Similar statements are found elsewhere in the Report. See *id.* at 87.

[FN249]. See NAS Voice ID Report, *supra* note 146.

[FN250]. See NAS DNA Report I, *supra* note 40; NAS DNA Report II, *supra* note 40; see also Office of Tech. Assessment, *supra* note 91.

[FN251]. See Nat'l Research Council, Nat'l Acad. of Scis., *The Polygraph and Lie Detection* (2003).

[FN252]. See NAS CBLA Report, *supra* note 186.

[FN253]. Nat'l Research Council, Nat'l Acad. of Scis., *Responsible Science: Ensuring the Integrity of the Research Process* 48 (1992); see also NAS Sharing Data Report, *supra* note 117, at 4 (advocating a "uniform principle for sharing integral data and materials expeditiously" or UPSIDE).

[FN254]. "The tobacco industry is the poster child for bending science, and its often path-breaking strategies will be featured throughout this book." McGarity & Wagner, *supra* note 127, at 27.

[FN255]. See Richard Saferstein, *Criminalistics: An Introduction to Forensic Science* 6 (5th ed. 1995) ("The oldest forensic laboratory in the United States is that of the Los Angeles Police Department, created in 1923 by August Vollmer, a police chief from Berkeley, California."); John I. Thornton, *Criminalistics—Past, Present, and Future*, 11 *Lex et Scientia* 1, 23 (1975) ("In 1923, Vollmer served as Chief of Police of the City of Los Angeles for a period of one year. During that time, a crime laboratory was established at his direction.").

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END OF DOCUMENT

Summer 2005 memo from FBI Lab Director Dwight Adams to FBI Director Robert Mueller explaining why the bullet lead science was being ended and stating that prosecutors should no longer rely on past bullet matches made by the FBI.

I have decided, as of yesterday, to discontinue the use of the technique known as bullet lead analysis.

Background: The FBI Laboratory independently sought an impartial scientific assessment of bullet lead analysis as early as 2000 through a contract with the Department of Energy, Ames Laboratory and again in 2002 through a contract with the National Research Council (NRC). The NRC issued their report on February 9, 2004. I specifically asked the committee chair if the FBI Laboratory should discontinue the use of bullet lead analysis while we make the recommended improvements and they replied "You should not discontinue this technique, only enhance it." Nevertheless, we did discontinue the test pending the outcome of our review of all NRC recommendations.

The NRC was asked three questions: (1) was the analytical method currently used sound? (2) were the statistics for comparison sound? and (3) were the conclusions reached with the analytical method and statistical comparisons valid?

ANALYTICAL METHOD - In short, the NRC stated that the "current analytical instrumentation used by the FBI is appropriate and is the best available technology. . . . the elements selected by the FBI for analysis are appropriate . . ."

STATISTICS FOR COMPARISON - The NRC recommended that the FBI use a different statistic than the one previously used. Much of the past year has been devoted to reviewing the different statistical approaches recommended by the NRC.

INTERPRETATION ISSUES - To have value as evidence in court, the interpretation of results depends on the quality of the chemical analysis, the statistical comparison, and the determination of the significance of the comparison. It is this last point which leads me to discontinue the technique. The following excerpts from the NRC report speak directly to the underlined portion:

"Variations among and within lead bullet manufacturers make any modeling of the general manufacturing process unreliable and potentially misleading in (bullet lead) comparisons."

". . . distribution information on bullets . . . either does not exist or is considered proprietary, and the committee was unable to assess regional distribution patterns. For these reasons, unlike the situation with some forms of evidence such as DNA . . . it is not possible to obtain accurate and easily understood probability estimates that are directly applicable."

BOTTOM LINE - our techniques are suitable and reliable. The recommended changes in statistical procedures would enhance our existing comparisons and provide a sound basis for declaring two samples as indistinguishable. However, the probative value of these findings and how that probative value is conveyed to a jury "remains a critical issue." In the end, it did not matter that we were using the best available technology. What mattered was our inability to determine the significance of our comparisons. We cannot afford to be misleading to a jury or state that two samples are indistinguishable, but not be able to state the significance of that fact or what it means.

FOLLOWUP ACTION - We plan to send a letter to all prosecutors that utilized this technology and provide them with the above information and direct them to the NRC report. We plan to simultaneously issue a press release confirming the above. We plan to discourage prosecutors from using our previous results in future prosecutions.

**2004 FBI e-mails in which lab employees
acknowledge that prior bullet lead matches would
be reversed if the lab used new statistical
methods recommended by the National Academy
of Sciences.**

Methods that have been used are valid, and all should have been noted in the report that was prepared at the time. In essence, it is merely a choice of valid statistical methods, and defense experts were and still are free to present their own findings under a different statistical method.

b6
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-----Original Message-----
From: [redacted] (LD) (FBI)
Sent: Tuesday, August 03, 2004 2:42 PM
To: ADAMS, DWIGHT E. (LD) (FBI)
Subject: FW: updated bullet lead memo
Importance: High

UNCLASSIFIED
NON-RECORD

FYI

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-----Original Message-----
From: [redacted] (LD) (FBI)
Sent: Tuesday, August 03, 2004 1:10 PM
To: [redacted] (OGC) (FBI); [redacted] (OGC) (FBI)
Cc: DIZINNO, JOSEPH A. (LD) (FBI)
Subject: FW: updated bullet lead memo
Importance: High

UNCLASSIFIED
NON-RECORD

I was unable to attend the meeting referred to below, but this closes part of the loop on the bullet lead issue. I touched base with Joe on this issue yesterday.

Basically, National Academy of Sciences (NAS) recommended using a different statistical model in doing certain calculations in the bullet lead analysis - it deals with the statistical interpretation of the data to help determine whether there is a match. The Laboratory had some reservations about adopting their proposed model, and so the Chemistry Unit conducted a study with 100 randomly selected cases, utilizing a variety of statistical models for each one. The results of the study show that a different statistical model actually leads to more conservative results in the large majority of the cases.

Note that in a very few cases, the model the Lab now prefers to use leads to a less conservative finding than that which was reported out at the time. Joe asked me to consider whether those cases would need to be contacted. In my opinion, they would not. All of the statistical methods that have been used are valid, and all should have been noted in the report that was prepared at the time. In essence, it is merely a choice of valid statistical methods, and defense experts were and still are free to present their own findings under a different statistical method. Please let me know if you wish to discuss.

The Lab plans to do a presentation on this study at the next American Forensic Society meeting, and is preparing two publications on the issue for forensic journals. Additionally, Joe would like to reach out to the two DOJ attorneys he and [redacted] met with on the bullet lead issue earlier, in order to update them on the study findings. If either of you would like to attend that meeting, please let me know. Otherwise, I'll try and set something up for [redacted] and myself fairly soon.

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b7c

Thanks -

[redacted]

[redacted] (LD) (FBI)

b6
b7C

From: [redacted] (LD) (FBI)
Sent: Wednesday, March 09, 2005 4:02 PM
To: ADAMS, DWIGHT E. (LD) (FBI)
Subject: RE: Bullet Lead Update



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NON-RECORD

Dwight,

I hear what you're saying and understand your concern. I would add, however, that this is a very tight examination now. There will be no such thing as an inconclusive, provided we could do the examination. Either they'll match or they won't using our revised statistical protocol. The exception may be with fragments where we can at least rule out a common source of the lead, but the new technique will not allow us to use a single measurement to claim that we have a match.

The only reason that we had issues in the past was because we allowed for a subjective variable...namely "experience"....to somehow figure into whether a call was made or not. Now it is all done behind the scenes with our statistical program. Looking at all the cases that we reported since 1996, only 1.4% of the cases resulted in a different report being issued. To the best of our ability, we have identified why those 7 cases have a different result today and it is mainly due to the use of "chaining"... some of it used quite liberally.

I think some of your concern may be due to discussions that were held last year when we were looking at the use of the "equivalence test". If we had continued with that method of assessing the data, we would have been making a lot more false exclusions. As you will recall, we switched horses at that point and did the false positive probability study that will allow us to use a very traditional statistical technique...namely the student t test. I can't imagine anyone really questioning the use of this statistical technique in the scientific community.

As far as peer-review of the method, I hope that you will also consider the NRC's report as part of the peer-review. We have done our best to meet their comments and recommendations.

I am also encouraged that since you aren't yet convinced about whether we should proceed or not until the process is finished, that I still have a chance to win you over on this.

Thanks for hearing me out. I greatly appreciate it!

[redacted]
Chief
Chemistry Unit
Laboratory Division
Quantico, VA 22135

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FAX [redacted]

2005 FBI e-mail stating the lab scientists should no longer use its 1.3 million estimate of the total number of bullets made in a single batch of lead because it could be misleading.

Message

Page 2 of 4

possessing bullets from the same CIVL.

You are right that the database has limitations, but it is what the NRC recommended we use to estimate false positive matches. In the end, that is all we can ever do when we are determining uncertainties...give it our best estimate based on what we have available to work with.

In the end, you are right, in that we can't give an exact number for anything related to bullet lead with 100% certainty, but that is why it is circumstantial evidence. We can make well-educated estimates, however, that help the judge and jury weigh in their own mind how probative (and unique) the information is.

Thanks.

Marc LeBeau
Chief
Chemistry Unit
Laboratory Division
Quantico, VA 22135
(703) 632-7408
FAX: (703) 632-7411
Cell: (202) 439-4408

-----Original Message-----

From: DIZINNO, JOSEPH A. (LD) (FBI)
Sent: Thursday, May 12, 2005 9:15 AM
To: LEBEAU, MARC A. (LD) (FBI)
Cc: CHOI, AMANDA ELLER (LD) (FBI); FRAM, ROBERT (LD) (FBI)
Subject: RE: Bullet Lead

UNCLASSIFIED
NON-RECORD

Marc,

I'd like to try to answer your questions and reiterate why I believe that we should leave 2 of these statements in the letter.

1) Saying that the examiner cannot testify to such facts as to how many bullets may have come from the same melt, I believe is true. You have indicated that the NRC said we should make a reasonable estimate, for example they suggested we say a billion .22LR could be produced from one CIVL. Where did the NRC come up with this number? I'm sure that it varies from manufacturer to manufacturer, from caliber to caliber or simply by chance of the process. Therefore, I don't believe that we can testify about how many bullets may have come from the same melt and our estimate may be totally misleading because we simply do not know for that particular bullet fragment in that case.

2) Saying how many bullets from a different melt may have a similar composition, I also believe is true. You indicate that the NRC said we should state that there was less chance of a bullet matching a different melt than one from the same melt. That, to me, however, is different from saying how many bullets from a different melt may have a similar composition. Also, you state that our own studies have shown that the chances of a false positive match are better than 1 in 5000. First, our database, compared to the huge world of bullets, is very small. Therefore, a good argument could be made that our database does not reflect the much larger world of bullets. I believe that we cannot say how many bullets from a different melt may have a similar composition because again we simply do not know for that particular bullet fragment in that case.

3) Your last point about geographic distribution of bullets being known by the manufacturer is well taken and I believe that we should modify this language.

If you have any other questions, please do not hesitate to give me a call.

11/23/2005

2006 FBI affidavit which uses the 1.3 million estimate for the total number of bullets made in a single batch of lead despite prior warning that it could be misleading.

CIRCUIT COURT for BALTIMORE COUNTY

James Allen Kulbicki

Plaintiff,

v.

State of Maryland

Defendant.

)
)
) CRIMINAL NO. 93CR0530
)
)
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)

AFFIDAVIT OF DIANA M. WRIGHT, Ph.D.

I, Diana M. Wright, state for the record:

BACKGROUND AND EXPERIENCE IN COMPARATIVE BULLET LEAD ANALYSIS

1. I am employed as a Forensic Examiner by the Federal Bureau of Investigation (FBI), and I am currently assigned to the FBI Laboratory, Scientific Analysis Section, Chemistry Unit, in Quantico, Virginia.

2. I obtained a Bachelor of Science degree in Chemistry from the College of Saint Elizabeth, Morristown, New Jersey and a Doctor of Philosophy degree in Chemistry from the University of Maryland, in College Park, Maryland.

3. I have been employed by the FBI Laboratory since August 3, 1997 where I was assigned to the Materials and Devices Unit (MDU). This unit later changed its name to the Materials

Analysis Unit (MAU). The subunit that was responsible for the analysis of bullet lead was incorporated into the Chemistry Unit (CU) in February, 2002, where the exam was performed until it was discontinued in September, 2005.

4. Comparative bullet lead analysis involves the physical and chemical examination of the lead portion of expended bullets, fragments of bullets, and bullets loaded into cartridge cases which are considered to be "live" or functional rounds of ammunition. Evidence of this type is submitted to the FBI Laboratory in support of investigations involving criminal cases from law enforcement agencies throughout the United States. The majority of this evidence is submitted by city, county and state agencies. This evidence is subjected to processes which include physical examination and comparison of the fired bullets to the bullets loaded in the live ammunition. These examinations include physical measurements, weight comparisons, removal of surface contamination or effect coating (e.g. copper plating or jacketing material), and sectioning of the lead portion of the bullet in order to take replicate measurements of the evidence. The chemical examination requires digestion of the lead in an acid solution, along with appropriate commercially-available standard reference materials, followed by analysis using instrumental methods.

5. During my career with the FBI Laboratory, my areas of expertise as a Forensic Examiner have included comparative bullet lead analysis, gunshot residue analysis, and the analysis and comparison of paints, tapes, and polymeric materials. I have supervised laboratory chemists and am responsible for the analysis and interpretation of the data obtained during examination of items of evidence. Upon a complete and thorough technical and administrative review of all data generated in a case, I prepare a laboratory report stating the conclusions I derived from the work performed. I also testify to my results and conclusions upon request.

6. As a Forensic Examiner, I have been responsible for the analysis of over 250 cases during my tenure with the FBI Laboratory. I have issued reports regarding the results of my

analyses in each case, and have been responsible for the review and verification of the results and conclusions of other forensic examiners.

7. In my position with the FBI Laboratory, I have testified to the results of my analyses eleven times, both in trial and admissibility hearings, across the United States, including one testimony provided at the request of the defense.

8. In the nine years that I have been involved in the field of comparative bullet lead analysis, I have had the opportunity to present the findings of research in this area in the form of scientific posters, oral presentations, and/or publications. The citations for this work are as follow:

Wright, Diana M. and LeBeau, Marc A. "An Analytical Approach to Comparative Bullet Lead Analysis: Physical and Chemical Aspects of Discrimination." Poster presented at the 57th American Academy of Forensic Sciences meeting, New Orleans, Louisiana, February 2005.

Wright, Diana M. and LeBeau, Marc A. "Choosing a Statistical Method for the Data Assessment of the Compositional Analysis of Bullet Lead." Poster presented at the 57th American Academy of Forensic Sciences meeting, New Orleans, Louisiana, February 2005.

Wright, Diana M. and LeBeau, Marc A. "The FBI Laboratory's Response to Recommendations Regarding Comparative Bullet Lead Analysis." Oral presentation at the 57th American Academy of Forensic Sciences meeting, New Orleans, Louisiana, February 2005.

Koons, R.D. and Grant D.M. "Compositional Variation in Bullet Lead Manufacture." *Journal of Forensic Science*. 47(5), Sep 2002.

9. I have also attended meetings, symposia and conventions to remain current with the field. I have had continuing education in the specialized instrumentation used to perform elemental examinations, toured ammunition manufacturing plants and smelters that refine recycled battery lead into alloys used to manufacture bullets, and routinely read scientific journals and publications that contain research articles and papers in the areas of forensic analysis of metals, advances in methods and instrumentation used to analyze elements, and general analytical chemistry.

10. See attachment A for a copy of my curriculum vitae.

The Basis of Comparative Bullet Lead Analysis

Examination of Physical Characteristics

11. As with many mass-produced commodities, lead bullets are readily available in many shapes, sizes, and designs. Bullets may be commonly found in retail outlets for a wide variety of firearms and end uses. The caliber of the firearm determines the bullet size and shape is often a function of its utility. However, styles that include full or partial jacketing, or ridges referred to as cannelures, are often influenced by marketing trends or ease of recognition in the production setting. Each of these features can be used to discriminate bullets and bullet fragments from bullets loaded as components of functional ammunition.

12. As an example, just as a truck fender would not be concluded to have come from a compact car, a bullet fragment that weighs more than an intact bullet would indicate that these two specimens were not manufactured in the same product line. Therefore, the fragment and the bullet in the live cartridge would be considered forensically unrelated with respect to the bullet evidence. In the same manner, a bullet fragment that contained a copper jacket would be readily

discriminated from live ammunition that was produced asunjacketed. Other discriminating features may be more subtle, such as the shape of a rounded bullet nose. However, even these distinctions are readily apparent to an analyst trained to observe the physical characteristics of manufactured products.

13. Visual, microscopic, and physical examinations such as these comprise the first steps in the comparison of expended bullets to the bullet components of functional ammunition.

Examination of Chemical Characteristics

14. Once physically different ammunition has been excluded from the comparison and documented as such, specimens that cannot be differentiated through appearance or mass are assessed and compared. Further examination requires physical alteration of the evidence. Therefore, detailed notes and photographs are used to document the appearance and any markings on the specimens chosen for chemical analysis. Using a microscope to capture surface details, a scalpel is employed to remove external contamination from the lead portion of unjacketed bullets. Jacketing material is removed through the use of a hand-held drill. The lead is then sectioned into three discrete samples in order to perform replicate measurements on each bullet.

15. The three lead samples from each bullet or bullet fragment are individually weighed on an analytical balance before they are digested in a solution of mineral acids which breaks down the lead matrix, leaving behind a clear, colorless solution. These solutions are then analyzed using an instrument known as a spectrophotometer. A spectrophotometer measures the amount of light that is emitted from a solution when it is subjected to conditions (e.g. heat or light energy) that cause a response of this type. The technique used to analyze bullet lead in this manner is referred to as inductively coupled plasma – optical emission spectroscopy (ICP-OES). Literature from the early days of this technique also referred to the technique as ICP-AES, where the “a” referred to “atomic” emission as opposed to “optical”. The latter term is more general, and therefore, a better

descriptor for the number of processes that occur in this technique.

16. ICP technology was developed and first reported in the early 1960s by researchers in both the United States and England. Many laboratories were also at work on applications involving neutron activation analysis (NAA) during this time period. NAA is the technique that preceded ICP-OES as the common method of analysis for many types of materials including bullet lead in forensic applications. Though NAA can only be performed at facilities that are licensed to operate a nuclear reactor, such as the National Institutes of Standards and Technology (NIST), both techniques share widespread acceptance in the relevant scientific community and may be found in the scientific literature for many forensic materials such as paint, metals, archaeological ceramics, and bullet lead. In order to ensure chain of custody integrity and minimize radiological waste, the FBI Laboratory ceased all NAA operations at NIST in favor of ICP-OES exclusively in 1995.

17. See attachment B for a list of articles related to ammunition manufacturing and forensic uses of NAA and ICP-OES.

18. ICP-OES is an instrumental technique whereby a sample, most commonly a solution, is drawn up into a gaseous environment that is partially ionized through the use of a radiofrequency generator. This environment contains so much energy that the gas is actually converted to a plasma state where electrons roam freely. The solution absorbs this energy which evaporates the liquid and allows for interaction of the electrons with metals in the solution. The metals become excited by the amount of energy they absorb, which creates an unstable state. In order to regain stability, the metals release the excess energy in the form of light. The wavelength at which the light is emitted is characteristic of the metal releasing the energy.

19. Through the use of standards that were specifically selected to contain the elements of interest in bullet lead, the amount of each element in the bullet lead solution can be determined by recording the amount of energy that is released at a given wavelength.

20. The presence and amount of these elements in each specimen is recorded and compared in order to determine if differences exist. Most bullet lead is specified by the manufacturer to contain a general amount of the chemical element, antimony (Sb), in order to harden the lead matrix. Gross disparity in the amount of antimony present in two specimens is a clear point of chemical differentiation between two bullets that could not be separated based upon physical characteristics. More subtle differences in composition between specimens require an assessment of how well the replicate measurements agree for each specimen.

Interpreting the Significance of a Match

21. There are only two likely explanations for obtaining a positive association between lead bullets. Either the bullets originated from a common origin of molten lead or the association is coincidental. It is important, therefore, to consider and determine the likelihood of a coincidental match.

22. When considering the significance of a positive association, an analyst might testify in a qualitative sense regarding the meaning of the results. With respect to bullet lead, some of the information used to determine if an association existed would be based on quantitative evaluation of the amounts of each element of interest that are present in trace quantities in the lead. However, the assessment would be made with the knowledge that many thousands of physically and chemically consistent bullets are produced virtually simultaneously within a given manufacturing plant.

23. Testimony would routinely describe how common a particular brand of ammunition is, how much of the style and caliber of interest is made per annum, and how much may be theoretically manufactured within a given batch before the properties are subtly altered by lead added to continue the process. This type of information is commonly discussed in other areas of

forensic science where manufactured products are submitted for examination. The particular characteristics of evidence examined within a given case may allow for a limited number of potential sources to be developed (i.e. limited to a manufacturer, style, or batch of molten lead). However, with the exception of fracture matches, examination of the manufactured physical and chemical properties of a mass produced entity can never be used to identify or classify comparable specimens to the exclusion of all other items of similar origin that may exist in the marketplace.

24. The FBI has maintained a searchable database of all lead standards and bullet lead specimens analyzed in its laboratory by ICP-OES. This file was kept in order to plot trends in the analysis of the standards used for quality control purposes. It was also compiled to determine if enough data could be collected to assess the likelihood of a coincidental match between chemically indistinguishable specimens. It was realized early on in the establishment of this file that the specimen content was only representative of the specimens received by the FBI Laboratory in casework. It was not representative of the number or type of ammunition products available in the world at any given point in time.

25. Legal challenges to the probative value of comparative bullet lead analysis have made reference to this data file of bullet lead specimens analyzed by the FBI Laboratory in an attempt to require a statistical assessment of the likelihood of a random or coincidental match between otherwise unrelated lead bullet specimens. In response to arguments in favor of establishment of some basis for the likelihood of coincidental matching, the FBI Laboratory reported in 2004 that the likelihood of coincidentally matching two unrelated bullets in this data file was 1:2500, a number corroborated by independent researchers who were granted access to the FBI bullet lead file.

26. Refer to attachments C and D for the publications that document the statistical work performed to establish a coincidental match rate for bullet lead using the FBI bullet lead data file.

**RESEARCH REGARDING THE FBI LABORATORY'S COMPARATIVE BULLET
LEAD EXAMINATION**

27. The FBI Laboratory established the comparative bullet lead program in response to requests for examination of the bullet fragments recovered from the body of President John F. Kennedy and the ammunition recovered from the firearm believed to have been used in his assassination. Establishment of the examination for routine casework followed from those initial efforts to determine if an association could be made between fragmented bullets and functional ammunition.

28. Two papers written by Gallagher and Haney were published in the mid 1970s regarding the FBI Laboratory's attempts to identify elements of interest in bullet lead specimens. From this work and that reported by others studying the potential for this examination, it was determined that three elements were best suited for chemical discrimination of bullet lead specimens: antimony, arsenic, and copper. These three elements were easily measured using NAA, thereby establishing the technique of choice for this examination.

29. The decision to incorporate ICP-OES technology into the examination of bullet lead was based on research reported in the scientific literature by manufacturers of battery lead as well as others. These studies described the ability to readily obtain chemical information on a greater number of elements that might serve to better discriminate lead specimens. For this reason, the FBI Laboratory began research into the use of ICP-OES methodology in concert with the existing NAA protocol. Through the simultaneous use of both techniques, the FBI Laboratory could obtain ICP-OES data for the three elements analyzed by NAA in addition to other elements that were not easily determined with the standardized NAA procedure. As a result of the improved discriminating capability, both techniques were used to gather comparative bullet lead for a number of years. In 1995, the reactor used to perform the NAA examination was scheduled for a

lengthy shutdown for upgrade and repair. At this time, the FBI Laboratory made the decision to switch exclusively to the use of ICP-OES for bullet lead chemical comparisons.

30. Refer to attachments E and F for the original research article that described the use of ICP-OES for battery lead and the FBI Laboratory's 1988 article describing its bullet lead protocol.

31. The analytical ability to discriminate between bullet lead specimens was well established in the scientific literature by the late 1980s. However, the FBI Laboratory knew experientially that bullets contained in a partial box of cartridges could have slight, yet distinct, differences in concentration of the elements of interest. In other words, most of the elements might agree to a reasonable degree of scientific certainty, but one element might differ to the extent that specimens could be excluded from a common source. For this reason, a box of ammunition cannot be considered to be a single unit of chemically identical samples. It is more appropriately compared to a carton of eggs, where some of the eggs may be from the same hen, some from a close relative of that hen, and still others from a more distant relative. All of the eggs in the described carton would be physically indistinguishable, but subtle chemical differences might be used to separate out "sister" eggs from first or second cousins. Experiential knowledge of the existence of subtle differences between bullets loaded into the same box paved the way for a research project conducted by the FBI Laboratory in the early 1990s. This project involved the analysis of multiple boxes of cartridges from the four major North American producers of ammunition.

32. The goal of the multiple boxes study was to determine if a minimum number of cartridges would need to be analyzed from a partial box of ammunition in order to best represent the number of distinct compositions that could be found in an intact box. The study was designed to determine the variability within a manufacturer's product as well as between the four major manufacturers of domestically produced ammunition. The study was presented to the forensic community at a symposium sponsored by the FBI Laboratory in June, 1991. Manuscripts for each of the presented topics were also submitted to a peer review committee and later published as

proceedings from the symposium.

33. The 1991 publication of the multiple box study describes the results obtained from the analyses performed on triplicate samples of over 800 bullets. The number of bullet lead compositions that could be found in a box of 50 cartridges ranged from two to thirteen, indicating that not all manufacturers employed the same level of quality control to the lead used for bullet manufacturing. It was later determined that the manufacturer with the fewest number of compositions in a box obtains their lead from a single supplier, thereby greatly decreasing the variability that might exist between batches. The manufacturer with the greatest variability used at least two different lead suppliers and would internally recycle or non-compliant bullets back into their molten lead supply pot in order to eliminate waste. Those recycled bullets could be of any caliber or contain a copper effect coating prior to being recycled back into the main supply pot. Therefore, chemical compositions of antimony (as the alloying element) or copper could vary widely in a batch containing the recycled lead as opposed to the normal conditions used for a given product. The paper concluded that the determination of multiple compositions of lead associated with a victim or crime scene which could not be differentiated from multiple compositions within a partial box of cartridges would be forensically significant because each of the compositions would be an independent association between the crime and the recovered box of ammunition. On the other hand, if bullets from a victim were close in composition to compositions represented in a box of ammunition, but could still be distinguished based on subtle differences, no association of probative value could be reported.

34. In recent years, increasing requests for admissibility hearings and Daubert rulings have dictated that bullet lead analysts provide a more thorough introduction to the history and protocol of comparative lead analysis. In order to provide background information in laymen's terms, the FBI Laboratory published a peer-reviewed paper in *Forensic Science Communications* in July, 2002, which described the basis for the examination, how bullets are manufactured, and what factors would need to be addressed in attempting to assess the significance of a match.

35. Also in 2002, the FBI Laboratory published the results of a second study that addressed the compositional variation that can exist within lead supplied to ammunition manufacturers and that which is produced in successive batches of lead by a single manufacturer. From this study, it was concluded that the maximum number of .22 caliber bullets that could be produced from a typical batch of lead would be approximately 1.3 million. In attempting to determine how significant this number is, one would also have to factor in that billions of bullets are produced per annum, half of which are .22 caliber in diameter. One would also need information as to the number of points of comparison that were available for assessment. A lesser number of physical or chemical features available for comparison would increase the chances of a coincidental match. However, there exists a greater risk of "coincidence" if two persons purchased ammunition from the same batch which could not be differentiated, than for two random specimens from separate batches to have completely indistinguishable properties. Other factors which are not readily available but could impact the significance of a bullet lead exam would include the number of bullets distributed as cartridges to a particular region of the country, the number of bullets from the original total produced that still existed in the marketplace at the time of interest, and the number of cartridges that were packaged together for individual sale (i.e. loose cartridges, 20 per box, 50 per box, or greater). Refer to attachment G for the referenced paper.

36. During this period of study, the FBI Laboratory determined that there was a limited ability to interact with a "peer community" given that it was the only laboratory that routinely offered and performed the comparative bullet lead examination. This limited interaction was compartmentalized into scientific discussions with instrumentation specialists and manufacturing discussions and trend assessments with ammunition producers and their lead suppliers. No peer group existed to discuss methods to best convey the significance of the examination either in written or oral form.

37. While bullet lead comparisons share many of the same characteristics and limitations

found in other trace element examinations, there are properties of this mass produced commodity that are specific to it. For example, the quality control processes utilized by the ammunition industry do not test the same parameters that are measured by the FBI Laboratory. This discrepancy has always been readily acknowledged by both parties as a difference in the information of interest. Nonetheless, the degree to which accuracy can be reported or challenged is hindered by this circumstance.

38. In the interest of developing a means to ensure quality and convey the probative value and limitations of comparative bullet lead analysis in the most effective manner, the FBI Laboratory requested an independent review of comparative bullet lead analysis from the National Research Council (NRC) of the National Academies in early 2003. The request was three-fold:

- a) to examine the analytical protocol used for bullet lead comparisons via ICP-OES and provide suggestions as to ways to improve upon it as appropriate;
- b) to examine the match criteria for the chemical data and provide suggestions as to ways to improve upon it as appropriate;
- c) to assist in the development of language that would best interpret the scientific data for both a non-scientific audience. Also, it was requested that language be offered to assist in significance assessments as appropriate.

39. The NRC published their evaluation of comparative bullet lead analysis in early 2004. The committee issued their report in the form of findings and recommendations based on their review of the FBI protocol and ancillary resources.

- a) Findings included the assessment that the current technology was appropriate and the best available for the exam.
- b) It was also reported that the examination was sufficiently reliable to support testimony that bullets produced from the same molten source of lead were more likely to be indistinguishable than bullets produced from different sources. This finding also stated that an examiner could appropriately testify that two (or more) bullets which could not be differentiated

would have an increased probability of resulting from the same source as opposed to having no probative association.

c) The committee's review also provided the outer limits of a size of a source of molten lead and thus the number of .22 caliber bullets that could theoretically be produced from such a source. The number of bullets reported in the FBI Laboratory's 2002 peer-reviewed paper in the *Journal of Forensic Sciences* falls well within the range reported by the committee, as does the estimate of bullets produced annually.

d) The NRC also found that there is sufficient data to conclude that a large number of different sources of bullet lead exist and that bullets from different sources could coincidentally be associated based on chemical composition. The FBI Laboratory has also stated this limitation in testimony and publications, particularly for specimens with limited physical or chemical features available for comparison.

e) Another finding stated that compositional bullet lead data could not be used to state the date of manufacture for that product. The FBI Laboratory agrees that there are no time or date stamps associated with bullets.

f) The NRC also reported that detailed patterns of ammunition distribution are not readily available and that geographic distribution data for ammunition would be needed before probabilities of association between victims and subjects could be derived from bullet lead data. To the contrary, geographic distribution would not be specific enough to associate a box of ammunition back to an individual. The best information that could be obtained from such data would be that a given region or store received some number of boxes of like composition. The potential for more than one customer to purchase indistinguishable ammunition would still exist. Thus, geographic distribution data might serve to further narrow the number of subjects with access to physically and chemically associated ammunition, which would increase the potentially probative value of the information.

g) The committee further reported that available data does not support a statement concerning the likelihood that an expended bullet originated from a particular box of ammunition and that references to boxes of ammunition should not be made in testimony. The objection to

such references appears to stem from the concern that such testimony might lead one to infer that there is a substantial probability that a given bullet originated from a specific box associated with the subject. The FBI Laboratory recognizes the limitations of comparative examinations that rely on mass produced characteristics or features in order to determine associative value. For this reason, it sought language suggestions from the NRC that would appropriately convey the circumstantial nature of bullet lead examinations without assigning classifications that would exceed the bounds of expert testimony. The probative value of examinations based on class characteristics is greater between specimens that can be disassociated as opposed to items that are concluded to be "alike". Assigning relevance to comparative specimens which cannot be distinguished is limited by the factors described in Paragraph 35, such as the number of features available for qualitative and quantitative comparison. A partial box of popular ammunition containing one bullet that is indistinguishable from an expended bullet may provide limited probative value. In contrast, a box containing multiple compositions of bullets that are also represented in bullets associated with a case provides more forensic significance because each of these associations is independently derived.

40. Though not recommended by the NRC, the FBI Laboratory chose to cease performing bullet lead examinations while reviewing the committee's report. The review encompassed all aspects of recommendations made by the NRC, including a voluntary re-validation of the chemical analysis and more thorough reporting of the physical examination in the protocol in order to best capture all aspects of the analytical process for publication. In considering bullet lead analysis in the context of other trace element examinations performed routinely in forensic laboratories, several facts were beyond dispute.

41. No clear methodology exists to independently test the accuracy of comparative bullet lead analyses. The FBI Laboratory annually requires proficiency testing of all analysts to determine accuracy; however, there is no way to independently corroborate the conclusions regarding significance without a peer group to also participate in the testing. With other trace

evidence examinations routinely conducted in the FBI Laboratory, there are other laboratories that exist within the forensic or manufacturing communities that perform the same examinations, and therefore, can be relied upon to judge the accuracy of the conclusions drawn in these disciplines. Bullet lead analysis is not required in cases where a firearm and bullet can be definitively associated. It is also an expensive technique to maintain if a laboratory's caseload does not warrant it. Comparative bullet lead analysis takes advantage of the use of loosely controlled quantities of trace elements that are present in the lead as impurities. Since manufacturing is not affected by the levels of these elements that exist in the lead, there is no industrial peer group available either. Each of these factors contributes to the classification of bullet lead analysis as non-routine.

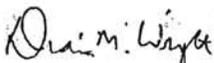
42. Corroborating data has been published by research laboratories during the time that the FBI Laboratory has used bullet lead analysis in casework. However, the probative value of the examination is determined by the jury once an FBI examiner has explained the process, findings, and limitations with respect to the opinion that can be derived from the evidence submitted. Recent challenges to comparative bullet lead analysis have questioned its probative value due to the large number of indistinguishable bullets that are simultaneously produced and the inability to track them once they are separated from the molten source. In this context, the FBI Laboratory recognized that this issue would continue to be contentious within the courts. It was conceded that the probative value could often be evaluated on a case-by-case basis and that this variability in weighting the information could confuse the trier of fact, particularly when so much background information was necessary to explain the basis of the examination.

43. As a result of the extensive review of the NRC report and the realized difficulties that the absence of a peer group and limited sourcing information produced, the FBI Laboratory announced in September 2005 that it would cease comparative bullet lead examinations. It is evident that the science is sound and the analysts who performed this examination during its forty-year history were proficient and knowledgeable in its use and limitations. However, jury education was often lengthy and could be inconsistent with respect to the emphasis placed on

significance and limitations. Therefore, in order to best serve the needs of the organization and its contributors, the FBI has decided to tailor its resources toward examinations and research that are more closely aligned with its core mission and responsibilities. This decision is in no way meant to convey a lack of confidence in the integrity of the examination or the analysts who conducted these examinations. The FBI Laboratory stands behind its conclusions and believes that the research conducted in this area provides a sound basis for the findings that have been reported throughout the history of the examination. The NRC report generally supports this position as well, while acknowledging that the ability to confirm or challenge the accuracy of the opinions offered may be beyond the limitations of scientific certainty at the present time.

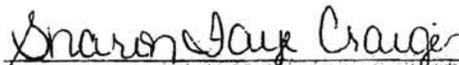
44. Based on my education, research, work experience, review of the scientific literature and contact with other scientists, I unequivocally state that comparative bullet lead analyses as conducted by the Chemistry Unit of the FBI Laboratory were valid and reliable to the extent that such assertions can be corroborated.

Signed under the pains and penalties of perjury this sixteenth day of November, 2006,

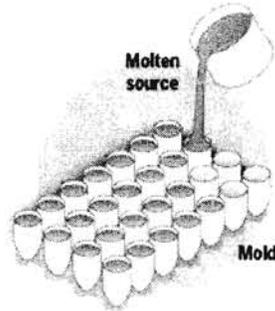

Diana M. Wright, Ph.D.

COMMONWEALTH OF VIRGINIA
COUNTY/CITY of STAFFORD, to-wit:

The foregoing instrument was acknowledged before me this 16th day of November, 2006, by
Diana M. Wright, Ph.D.


Notary Public

My commission expires: May 31, 2008



Background: How bullets are made

Lead alloy is melted from leftover car batteries. The liquid is poured into a mold. All bullets poured from the same batch of molten lead are considered to be from the same "lot." Studies estimate that as many as 35 million bullets can come from a single source.

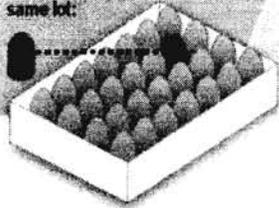
Two assumptions were made about this process, leading to the theory that a single bullet's characteristics would be representative of all other bullets in the lot:

ASSUMPTION 1: The molten source has a uniform composition throughout.

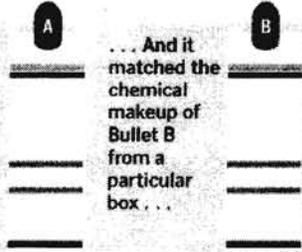
ASSUMPTION 2: No two molten sources have the same composition.

The Old Theory: Matching Bullet Composition Equals Shared Source

Bullets with the same chemical composition were thought to come from the same molten source, and thus the same lot:



If crime-scene Bullet A had the following chemical makeup ...



... And it matched the chemical makeup of Bullet B from a particular box ...

... And if all members of that lot are assumed to share a unique composition (bullets from other lots would have a different composition because they were from different sources), then Bullet A was assumed to have come from the same lot as bullet B.



CONCLUSION

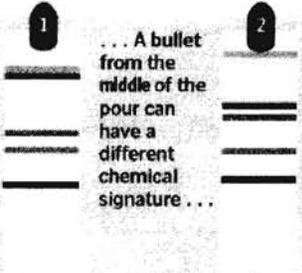
If a crime-scene bullet matched a bullet from a box, the possessor of the box was considered a likely suspect.

Current Science: Matching Bullet Composition Does Not Necessarily Prove Shared Source

Studies have shown variation in the makeup of bullets from various stages of a pour by the same molten source, and have disproved the idea that a source has a unique composition.



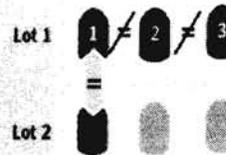
A bullet from the beginning of the pour can have one chemical signature ...



... A bullet from the middle of the pour can have a different chemical signature ...

... And a bullet from the end of the pour can have yet another signature that does not match the other two ...

... But a bullet's makeup has been shown to match bullets from other lots/sources.



CONCLUSION

A crime-scene bullet may match a bullet from a box, but that does not necessarily mean they came from the same source.

ASSUMPTION 1: The molten source has a uniform composition throughout. **FALSE**
Composition can vary throughout a pour, allowing bullets of the same lot to differ.

ASSUMPTION 2: No two molten sources have the same composition. **FALSE**
Compositions can be commonly repeated among different sources or lots.

VERIFICATION BY PETITIONER

I, Leslie Pounds, verify under penalty of perjury that the attached PRP is true and correct and is filed on my behalf.

5.11.11 Monroe, WA
Date and Place

Leslie Pounds
Leslie Pounds