

# JUDGING FIREARMS EVIDENCE AND THE RULE 702 AMENDMENTS

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**F**orensic firearms identification involves linking evidence collected from crime scenes — namely, fired cartridge casings and bullets — to a particular firearm. Two assumptions underlie this identification process: First, firearms impart unique toolmarks on bullets and cartridge cases; and second, trained examiners can spot these marks and reliably determine that they were created by the same gun. Such testimony has played a central role in criminal trials for more than a century, connecting specific guns to specific crimes.<sup>1</sup> But in recent times, the technique has faced increasing scientific and judicial scrutiny. This scrutiny is likely to increase as proposed amendments to Federal Rule of Evidence 702 — which governs expert testimony in federal courts — are set to take effect this December.

This essay summarizes a comprehensive review of more than 100 years of firearms comparison evidence case law. We first describe how judges' initial skepticism of the new methodology quickly transformed into near-un-

iversal acceptance, largely because confident experts displayed dazzling new technology, terminology, and techniques. But after decades of rote acceptance of the assumptions underlying firearms comparison evidence, judicial engagement and skepticism in the technique have surged. Of the judicial rulings discussing this kind of evidence that we reviewed for our comprehensive online database,<sup>2</sup> more than half were penned after 2010. Several factors are associated with this uptick, including the release of several scathing reports by the National Academy of Sciences (NAS),

the President's Council of Advisors on Science & Technology (PCAST), and the findings of new empirical studies that call into question the validity of firearm identification.

For the first time since 2000, the Federal Advisory Committee on Evidence Rules has proposed a set of amendments to Rule 702.<sup>3</sup> The revisions specifically make clear that: (1) the proponent of an expert must show, by a preponderance standard, that various reliability requirements are met; and (2) an expert's opinions must be supported by a reliable application of trustworthy methods to data.<sup>4</sup> ▶

**THE DRAMATIC RISE IN JUDICIAL ENGAGEMENT WITH THE SCIENTIFIC LIMITATIONS OF FIREARMS COMPARISONS ILLUSTRATES THAT SCIENTIFIC INPUT MATTERS TO JUDGES WHEN THEY APPLY *DAUBERT* AND RULE 702.**

## “SUFFICIENT AGREEMENT” AND ITS OPACITY HAVE BEEN REPEATEDLY CRITICIZED AS “CIRCULAR.” BUT IT REMAINS THE CRITERION WIDELY USED BY PRACTICING FIREARMS EXAMINERS.

These amendments stem from the committee’s growing concerns over courts’ failure to properly vet expert scientific evidence in criminal cases. The Advisory Committee notes emphasize that these revisions are “especially pertinent” to forensic evidence.<sup>5</sup> Further, for forensic pattern-comparison methods, like firearms evidence, the committee noted that opinions “must be limited to those inferences that can reasonably be drawn from a reliable application of the principles and methods.”<sup>6</sup> The Rules Committee’s proposed amendments to Rule 702 will take effect on December 1, 2023, unless Congress acts.<sup>7</sup>

The committee’s amendments are likely to affect a wide range of types of expert evidence. By clarifying the burden on the party seeking to introduce an expert and highlighting the need to assure reliable use of methods to reach conclusions, the committee’s concerns are particularly important in the context of forensic methods, like firearms evidence, that have grown out of the experience of practitioners but have never been carefully scientifically validated or subject to robust empirical testing. As we will describe, the rule change targets the two main concerns that judges have raised in that context — (1) methodological reliability and (2) the overstatement of opinions in conclusions reached by experts — in firearms evidence cases.

Judges have increasingly assessed firearms examiners’ evidence as part of admissibility challenges. The dra-

matic rise in judicial engagement with the scientific limitations of firearms comparisons illustrates that scientific input matters to judges when they apply *Daubert v. Merrell Dow Pharmaceuticals Inc.* and Rule 702. Over time, more robust oversight from both scientific and legal stakeholders is likely to promote enhanced accuracy of evidentiary methods. We conclude by examining lessons regarding the gradual judicial shift toward a more scientific approach.

### A Primer on Firearm and Toolmark Identification

An unfired cartridge case contains three basic components: (1) a primer (which is located at the head of the cartridge case); (2) propellant (i.e., gunpowder); and (3) a bullet. When someone pulls a gun’s trigger, the gun’s firing pin strikes the primer. This strike creates a spark, which ignites the propellant. The propellant’s ignition then forces the bullet to detach from the cartridge case and exit the firearm’s barrel.

This firing process can impart marks — called toolmarks — on the cartridge case and/or bullet.<sup>8</sup> Critically, different types of guns create different types of toolmarks. For example, because manufacturers produce firing pins of different shapes, these pins can leave distinct indentations on a primer. Similarly, each gun’s barrel is lined with grooves that impart a spiral spin on a bullet. These grooves vary by number and direction, so they also create their own marks. Practitioners call these

types of general features “class characteristics.”<sup>9</sup> The ammunition’s size is also a class characteristic. Class characteristics are a useful first step in firearm examination because practitioners can seek to rule out certain guns with clearly different class characteristics. Alternatively, observing similar class characteristics indicates that a particular firearm cannot be ruled out and thus warrants further examination.

But mere agreement of class characteristics is not enough to determine that bullets or cartridge cases were fired by a particular gun. To draw that inference, examiners must identify and evaluate “individual characteristics,” which are defined by the Association of Firearm and Toolmark Examiners (AFTE) as:

Marks produced by the random imperfections or irregularities of tool surfaces. These random imperfections or irregularities are produced incidental to manufacture and/or caused by use, corrosion, or damage. They are unique to that tool to the practical exclusion of all other tools.<sup>10</sup>

Examiners rely on training and experience to assess whether marks are these so-called “individual characteristics.”<sup>11</sup>

Examiners following the AFTE Theory of Identification — the process of toolmark identification used by most professional firearms examiners<sup>12</sup> — will compare the individual charac-

teristics of casings or bullets recovered at a crime scene to casing or bullet exemplars fired by a particular gun. Based on this comparison, examiners can reach one of several conclusions: identification, elimination, or inconclusive.<sup>13</sup> There are no numeric thresholds for how many individual characteristics must be observed before the examiner can declare an identification or match. Rather, the AFTE Theory states that an identification can be reached “when the unique surface contours of two toolmarks are in ‘sufficient agreement.’”<sup>14</sup> As defined by AFTE:

The statement that “sufficient agreement” exists between two toolmarks means that the agreement of individual characteristics is of a quantity and quality that the likelihood another tool could have made the mark is so remote as to be considered a practical impossibility.<sup>15</sup>

“Sufficient agreement” and its opacity have been repeatedly criticized as “circular.”<sup>16</sup> But it remains the criterion widely used by practicing firearms examiners.<sup>17</sup>

### The First Half-Century of Judicial Rulings

The first reported opinions discussing firearms comparison evidence date back to the 1870s and reflect mixed perspectives on the admissibility of expert testimony.<sup>18</sup> One of the earliest opinions on the topic was written in 1902 by none other than Oliver Wendell Holmes, then the chief justice of the Massachusetts Supreme Judicial Court. The defendant in that case — *Commonwealth v. Best*<sup>19</sup> — was convicted of murder. On appeal, Best argued that firearms comparison evidence was erroneously offered at the trial.<sup>20</sup> In his quintessentially succinct style, Justice Holmes swiftly disposed of these arguments, concluding that “the sources of error suggested were trifling.”<sup>21</sup> Despite this being one of the first published opinions on the admissibility of firearms toolmark evidence, Justice Holmes found “no reason to doubt that the testimony was properly admitted.”<sup>22</sup>

In a 1923 case, however, the Illinois Supreme Court powerfully rejected expert firearms comparison evidence.<sup>23</sup> That court reversed the conviction at issue for multiple reasons,<sup>24</sup> but it par-

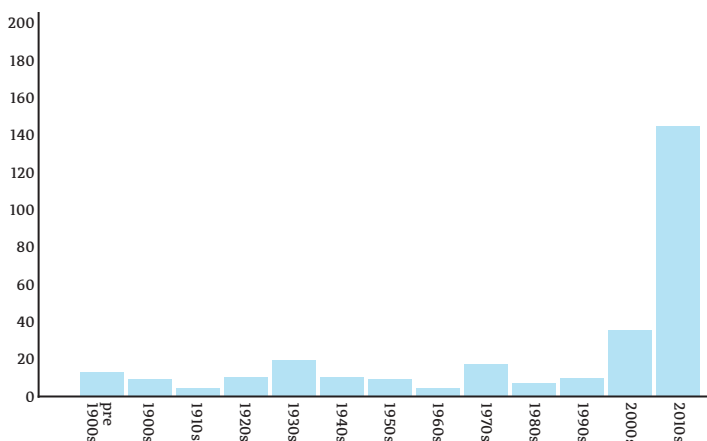
ticularly took issue with the state’s use of a police officer as an expert. The officer was “asked to examine the Colt automatic 32” in evidence, and at trial he testified that the gun “was the identical revolver from which the bullet introduced in evidence was fired on the night [the victim] was shot.”<sup>25</sup> The court disagreed:

The evidence of this officer is clearly absurd, besides not being based upon any known rule that would make it admissible. *If the real facts were brought out, it would undoubtedly show that all Colt revolvers of the same model and of the same caliber are rifled precisely in the same manner, and the statement that one can know that a certain bullet was fired out of a 32-caliber revolver, when there are hundreds and perhaps thousands of others rifled in precisely the same manner and of precisely the same character, is preposterous.*<sup>26</sup>

By the late 1920s, however, the Illinois Supreme Court’s skepticism marked the exception, not the rule. The courts were particularly wooed by the work of Major Calvin Goddard. Goddard had founded a private crime laboratory — the Bureau of Forensic Ballistics — and published a seminal article on firearm evidence for the U.S. Army.<sup>27</sup> In an especially influential case, *Evans v. Commonwealth*,<sup>28</sup> Goddard testified during trial that he “only required *one single test* to identify the bullet in evidence as having been fired through the Evans pistol.”<sup>29</sup> The Kentucky Supreme Court concluded that Goddard’s opinion was admissible, but only as a lay opinion, not that of an expert.<sup>30</sup>

Beginning in the 1930s, judicial acceptance of firearms comparison

**FIGURE 1. REPORTED U.S. FIREARMS RULINGS BY DECADE**



testimony spread nationally. Judges appeared powerfully influenced by *Evans*, which became one of the lode-star cases for admitting firearms comparison evidence. Soon, use of toolmark evidence in criminal prosecutions became “accepted” and “well-recognized.” By the 1970s and 1980s, courts routinely admitted firearms expert testimony, often citing to *Evans* without further discussion.<sup>31</sup> Courts did, however, expect examiners to possess specialized training and credentials. But judges did not question the methodology itself.

### Growing Judicial Skepticism

Following the U.S. Supreme Court’s *Daubert* ruling, federal courts might have been expected to begin to more carefully scrutinize firearms evidence, and some did so.<sup>32</sup> With this increased scrutiny, defendants’ objections began to shift away from concerns about specific experts’ qualifications to concerns about the reliability of the underlying methodology’ itself.<sup>33</sup>

But this change did not immediately follow the 1993 landmark case of *Daubert*. Instead, as Figure 1 illustrates, each decade through the 1990s reported a steady number of 20 or fewer judicial rulings regarding firearms comparison evidence. But by the

2000s, these rulings began to increase in number. Interestingly, the larger increase began after 2010.

An initial turning point may have been the District of Massachusetts’s 2005 ruling in *United States v. Green*.<sup>34</sup> There, the government sought to introduce expert testimony that the individual characteristics of six shell casings matched a recovered firearm “to the exclusion of every other firearm in the world.”<sup>35</sup> Then-Judge Nancy Gertner called this conclusion “extraordinary.”<sup>36</sup> She emphasized that in “distinguishing class and subclass characteristics from individual ones,” the examiner “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.”<sup>37</sup> Despite these concerns, Judge Gertner candidly acknowledged that “the problem for the defense is that every single court post-*Daubert* has admitted this testimony, sometimes without any searching review, much less a hearing.”<sup>38</sup> Judge Gertner thus admitted the testimony, but she did not “allow [the expert] to conclude that the match he found . . . permit[ted] ‘the exclusion of all other guns’ as the source of the shell casings.”<sup>39</sup> Slowly, other federal

courts began to follow Judge Gertner’s approach, and law enforcement agencies, such as the FBI, ultimately disavowed conclusions of a match “to the exclusion of every other firearm in the world.”<sup>40</sup>

### The NAS and PCAST Reports

Over half of the rulings in our database occurred after 2009, when the NAS released a groundbreaking report, *Strengthening Forensic Science in the United States*.<sup>41</sup> The 2009 report contains a scientific assessment of a variety of forensic science disciplines, along with recommendations for improvements.<sup>42</sup> The report critiques “the lack of a precisely defined process” for firearms evidence.<sup>43</sup> Because the AFTE methodology “does not even consider, let alone address, questions regarding variability, reliability, repeatability, or the number of correlations needed to achieve a given degree of confidence,”<sup>44</sup> firearms examiners are “not able to specify how many points of similarity are necessary for a given level of confidence in the result.”<sup>45</sup>

Building on this work, PCAST published a 2016 report evaluating commonly used forensic science techniques in criminal proceedings. PCAST evaluated all of the existing scientific studies that tested the validity of fire-

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**TABLE 1. TESTIMONIAL LIMITATIONS ON FIREARMS EXAMINERS**

EXAMPLES OF COURT-ORDERED CONCLUSION LANGUAGE	CITATIONS FROM SELECTED EXAMPLES
"more likely than not"	<i>United States v. Glynn</i> , 578 F. Supp. 2d 567 (S.D.N.Y. 2002)
"reasonable degree of ballistic certainty"	<i>United States v. Monteiro</i> , 407 F. Supp. 2d 351 (D. Mass. 2006)
"consistent with"	<i>United States v. Sutton</i> , No. 2018 CF1 009709 (D.C. Sup. Ct. May 9, 2022)
"a complete restriction on the characterization of certainty"	<i>United States v. Willock</i> , 696 F. Supp. 2d 536 (D. Md. 2010)
"the recovered firearm cannot be excluded as the source of the cartridge casing found on the scene of the alleged shooting"	<i>United States v. Tibbs</i> , No. 2016 CF1 19431, 2019 WL 4359486 (D.C. Super. Ct. 2019); <i>Missouri v. Goodwin-Bey</i> , No. 1531-CR00555-01 (Cir. Ct. Green County, Mo., Dec. 16, 2016)
"qualitative opinions" can only be offered on the significance of "class characteristics"	<i>People v. Ross</i> , 129 N.Y.S.3d 629 (N.Y. Sup. Ct. 2020)

arms identification. It concluded that, with a single exception, the studies were not appropriately designed to truly test firearms examiners' accuracy. Specifically, the tests used in the vast majority of studies was a sorting task that allowed examiners to use a process of elimination to make identifications. PCAST analogized the tests to a Sudoku puzzle, making the tests — and the incredible results — totally unlike real-world comparison work.<sup>46</sup> The sole study that PCAST deemed appropriately designed came from the Ames National Laboratory in Iowa (Ames I). That study reported a 1.01 percent false positive error rate (in other words, in about one out of 100 comparisons, the examiner incorrectly reported a match). However, this error rate ignores the substantial number of inconclusive results provided by examiners.<sup>47</sup> PCAST concluded that "[b]ecause there has been only a single appropriately designed study, the current evidence falls short of the scientific criteria for foundational validity."<sup>48</sup> Much like the NAS report that preceded it, PCAST pointed to

the need for additional, appropriately designed studies to test the validity of firearm examination.<sup>49</sup>

Admissibility challenges to firearms identification evidence surged following the PCAST report's release. These challenges were largely unsuccessful. But in 2019, Judge Todd Edelman in the D.C. Superior Court conducted an extensive admissibility hearing. In that hearing, the court considered these reports, as well as testimony from mainstream research scientists, who explained the principles of scientific testing and why, contrary to the claims of firearms examiners, the studies do not actually show low error rates.<sup>50</sup> Following the hearing, the judge issued a ruling that "precluded the government from eliciting testimony identifying the recovered firearm as the source of the recovered cartridge casing." Instead, the Court ruled that the government's expert witness must limit his testimony to a conclusion that the firearm "cannot be excluded as the source of the casing."<sup>51</sup>

Other courts around the country began to follow suit.<sup>52</sup> One court noted,

however, that the FBI and the Ames Laboratory were "currently conducting a second black box study on the AFTE Theory,"<sup>53</sup> and the results of that study could potentially change the trajectory of recent opinions.

That study — the FBI/Ames Laboratory study (Ames II) — has become a modern mystery. A detailed report of the study was first posted online in early 2021 and admitted into evidence in several trials.<sup>54</sup> But the report seems to have been subsequently scrubbed from the internet. A portion of the report was recently published in a peer-reviewed journal, though all of the research scientists from the Ames Laboratory "declined authorship and individual acknowledgment."<sup>55</sup> The published study reports false positive error rates of less than 1 percent, though scientists have raised serious questions about those estimates' veracity.<sup>56</sup> Still, the portion of the study that was not published is a rather stinging indictment of forensic firearms identification: When an examiner analyzed bullets or cartridge cases a second time, she reached a different conclusion 21–38 percent of the time.<sup>57</sup> Even worse, when two different examiners analyzed the *same bullets or cartridge cases*, they reached *different conclusions* 32–69 percent of the time.<sup>58</sup>

### Testimonial Limitations and Post-NAS and PCAST Rulings

While courts have mostly continued to admit firearms examiner testimony, many now admit the testimony "only under limiting instruction[s] restricting the degree of certainty" to which experts may express their identifications.<sup>59</sup> The resulting case law is diverse, sometimes inconsistent, and reflects a gradual evolution. Some of the initial decisions that followed the 2009 NAS report held that

## SOME COURTS HAVE LIMITED FIREARMS TESTIMONY TO OPINIONS OFFERED ON CLASS CHARACTERISTICS ONLY. THAT IS, AN EXPERT COULD EXPLAIN THAT A CERTAIN TYPE OF GUN FIRED THE RELEVANT BULLETS OR CARTRIDGE CASES, BUT THE EXPERT COULD NOT TESTIFY THAT THE SAME GUN FIRED TWO BULLETS OR CARTRIDGE CASES.

an examiner could only testify to a milder degree, forbidding aggressive statements like “to the exclusion of all other firearms in the world,”<sup>60</sup> and instead imposing a more cautious formulation of confidence, such as a “reasonable degree of ballistic certainty.”<sup>61</sup> Other courts have taken a different approach, using more familiar standards of proof as a frame of reference. For example, courts have ruled that examiners could only opine that it was more likely than not that a bullet recovered from the crime scene came from the defendant’s firearm.<sup>62</sup> The table at right summarizes some of the main approaches that courts have taken toward limiting testimonial conclusions about whether a bullet found at the scene came from the firearm in question.

While the consensus approach in the early 2000s adopted the formulation of “a reasonable degree of ballistic certainty,” it is not clear what level of confidence actually constitutes a “reasonable degree of certainty.” Starting in 2020, the U.S. Department of Justice (DOJ) therefore barred examiners in federal cases from using that or similar terminology.<sup>63</sup> DOJ also prohibited examiners from making assertions of a “zero error rate” or “infallibility.”<sup>64</sup> Some judges have likewise begun to scrutinize experts’ probabilistic claims and limited experts’ ability to claim infallibility or a lack of error rate.<sup>65</sup>

A growing group of judges also offer intermediate approaches. For example, a District of Columbia judge held that an expert could testify that the ammunition in question was “consistent with” being fired from a particular firearm.<sup>66</sup> Another district court ordered that an expert could offer a statement of consistency but “may not testify, to any degree of certainty, that the recovered firearm is the source of the recovered bullet fragment or the recovered shell casing.”<sup>67</sup>

In more recent cases, judges have barred experts from making any certainty-based conclusions whatsoever. For example, one court ruled that the examiner could not offer any probability that the firearm in question was the source of a cartridge. Instead, the examiner could testify only that “the recovered firearm cannot be excluded as the source of the cartridge casing found on the scene.”<sup>68</sup> In yet another case, the district judge ordered “a complete restriction on the characterization of certainty.”<sup>69</sup> The Maryland Supreme Court recently ruled that an expert can only opine on whether spent bullets or cartridges are “consistent or inconsistent” with those known to have been fired by a particular weapon.<sup>70</sup>

### *i. Limiting Non-Class-Based Opinions*

Going even further, some courts have limited firearms testimony to opinions offered on class characteristics

only.<sup>71</sup> That is, an expert could explain that a certain *type* of gun fired the relevant bullets or cartridge cases, but the expert could not testify that the *same* gun fired two bullets or cartridge cases. Courts have reasoned that descriptions of class characteristics are objective and measurable, while linking bullets to a particular gun is not “the product of a scientific inquiry.”<sup>72</sup>

### *ii. Qualification and Proficiency Rulings*

Judges have also focused on Rule 702’s preliminary question: whether the proffered expert has sufficient “knowledge, skill, experience, training, or education” to offer conclusions.<sup>73</sup> In *United States v. Cloud*,<sup>74</sup> for example, the judge emphasized that one of the two examiners had failed a proficiency test when finding that examiner not qualified to testify.<sup>75</sup> Typically, proficiency tests for forensic examiners are administered by commercial test providers, and accredited labs are required to administer such tests annually.<sup>76</sup> While these tests present their own concerns of reliability and consistency, they nonetheless highlight the types of errors that practitioners may make. As one of the authors and Gregory Mitchell have argued, a careful inquiry into objective proficiency of the witness should be an integral part of the question of whether a person should be qualified as an expert.<sup>77</sup>

### iii. “As Applied” Challenges

Still additional opinions have focused on Rule 702(d), which provides that qualified expert testimony is admissible only when “the expert has reliably applied the principles and methods to the facts of the case.”<sup>78</sup> These “as applied” challenges focus on the expert’s actual work. They examine not just whether the expert followed the right steps, but also on whether the expert’s casework was actually supported by a valid method.<sup>79</sup> Opposing parties have focused on, for example, firearms experts’ lack of documentation and the way they applied their methods to a particular case.<sup>80</sup> Some courts have found the presence of some documentation, such as “notes, worksheets, and photographs” to be sufficient to admit the expert evidence.<sup>81</sup>

### A Sign of What’s to Come?

The arc of judicial review of firearms evidence follows a pattern familiar in forensics generally. After initial rulings that predated modern scientific methods, judges responded to more recent scientific critiques by limiting firearms evidence in a range of ways. Although “an overwhelming acceptance” of firearms identification persists,<sup>82</sup> long-entrenched judicial acceptance has eroded in recent years.

Indeed, in perhaps a sign of things to come, a trial judge in Cook County, Ill., recently excluded firearms expert testimony entirely, based on scientific concerns with reliability. There, the judge concluded that the probative value of the evidence was a “big zero” and raised the concern of “yet another wrongful conviction” based on such evidence if the jurors viewed “[t]he combination of scary weapons, spent bullets, and death pictures without even a minimal connection” to expertise that is repeatable and reproducible.<sup>83</sup>

The proposed amendments to Federal Rule of Evidence 702 reflect yet another step in this direction. They encourage judges to more carefully ask whether the proponent of an expert has met the rule’s reliability requirements and whether the expert’s opinions are themselves scientifically supported.<sup>84</sup> As noted above, the Advisory Committee notes additionally emphasize that expert opinions must be supported by reliable principles and methods:

Expert opinion testimony regarding the weight of feature comparison evidence (i.e., evidence that a set of features corresponds between two examined items) must be limited to those inferences that can reasonably be drawn from a reliable application of the principles and methods.<sup>85</sup>

Further, the committee has emphasized that how broadly or narrowly opinions are expressed by experts should be informed by research. The

committee explained that: “In deciding whether to admit forensic expert testimony, the judge should (where possible) receive an estimate of the known or potential rate of error of the methodology employed, based (where appropriate) on studies that reflect how often the method produces accurate results.”<sup>86</sup>

This guidance tracks the approach in more recent judicial rulings regarding firearms evidence, rulings in which judges have examined evidence regarding error rates and have limited testimony, in part or entirely, based on what can be drawn from the methods at issue. The years to come may see increased litigation of these issues, particularly where the 702 amendments, drafted with forensic pattern evidence in mind, serve to highlight each of the main questions to be addressed. This history of firearms evidence suggests how the slow, but perhaps steady, reception of science may continue to inform our halls of justice. ▶



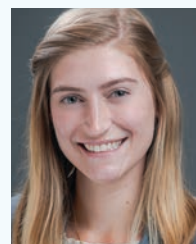
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1 This essay is adapted from a forthcoming law  
2 review article that details our findings. See  
3 Brandon L. Garrett, Nicholas Scurich & Eric  
4 Tucker, *Judging Firearms Evidence*, 97 S. CAL. L.  
5 REV. (forthcoming 2024), [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=4325329](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4325329).  
6 CTR. FOR STATS. & APPLICATIONS IN FORENSIC EVIDENCE,  
7 FIREARMS EXPERT EVIDENCE DATABASE (2022), <https://forensicstats.org/firearms-expert-evidence-database/>. We compiled the database using searches  
8 of legal databases across all 50 states and the  
9 federal government, which we supplemented  
10 with unpublished court orders where available.  
11 Where possible, trial rulings were obtained,  
12 but generally these cases reflect reported,  
13 written decisions containing the keywords  
14 used, and therefore largely reflect appellate  
15 rulings. The cases are searchable across a range  
16 of characteristics, including basic information  
17 concerning the state, year, type of court, and  
18 parties, but also details concerning the basis  
19 of the rulings and the factors relied upon by  
20 each court. The database describes whether the  
21 ruling employed a *Daubert* or *Frye* standard, or  
22 a ruling regarding local rules of evidence, and  
23 what the result of that ruling was.  
24 Memorandum from the chair of the Committee  
25 on Rules of Practice and Procedure to the clerk  
26 of the Supreme Court 227 (Oct. 19, 2022), [https://www.uscourts.gov/sites/default/files/2022\\_scutus\\_package\\_0.pdf](https://www.uscourts.gov/sites/default/files/2022_scutus_package_0.pdf).  
27 *Id.*  
28 *Id.* at 228.  
29 *Id.* at 230.  
30 COMM. ON RULES OF PRAC. & PROC. 891-93 (June 7,  
31 2022), [https://www.uscourts.gov/sites/default/files/2022-06\\_standing\\_committee\\_agenda\\_book\\_final.pdf](https://www.uscourts.gov/sites/default/files/2022-06_standing_committee_agenda_book_final.pdf).  
32 See GLOSSARY OF THE ASS'N OF FIREARM & TOOL  
33 MARK EXAM'RS 125 (6th ed. 2013), [https://afte.org/uploads/documents/AFTE\\_Glossary\\_Version\\_6.091922\\_FINAL\\_COPYRIGHT.pdf](https://afte.org/uploads/documents/AFTE_Glossary_Version_6.091922_FINAL_COPYRIGHT.pdf) (defining  
34 impressed toolmarks as “[c]ontour variations on  
35 the surface of an object caused by a combination  
36 of force and motion where the motion of the  
37 tool is approximately perpendicular to the plane  
38 being marked”).  
39 The official definition used by the Association  
40 of Firearms and Toolmark Examiners (AFTE)  
41 is: “Measurable features of a specimen which  
42 indicate a restricted group source. They result  
43 from design factors and are determined prior  
44 to manufacture.” *Id.* at 38.  
45 *Id.* at 65.  
46 See SCI. WORKING GRP. FOR FIREARMS & TOOLMARKS, THE  
47 FOUNDATIONS OF FIREARM AND TOOLMARK IDENTIFICATION  
48 2 (2013), [https://www.nist.gov/system/files/documents/2016/11/28/swggun\\_foundation-al\\_report.pdf](https://www.nist.gov/system/files/documents/2016/11/28/swggun_foundation-al_report.pdf). These incidental striations  
49 are often called “subclass characteristics,” or  
50 features that may be produced during manufac-  
51 ture that are consistent among items fabricated  
52 by the same tool in the same approximate state  
53 of wear. See G.C. Rivera, Subclass characteristics  
54 in Smith & Wesson SW40VE sigma pistols, 39  
55 AFTE J. 247 (2007).  
56 Nicholas Scurich, Brandon L. Garrett & Robert  
57 M. Thompson, *Surveying Practicing Firearm*  
58 *Examiners*, 4 FOR. SCI. INT'L SYNERGY, 2022, at 3.  
59 AFTE Range of Conclusions, THE ASS'N OF FIREARM  
60 & TOOLMARK EXAM'RS, <https://afte.org/about-us/what-is-afte/afte-range-of-conclusions> (last  
61 visited Aug. 14, 2023).  
62 *Id.*  
63 *Id.*  
64 See, e.g., EXEC. OFFICE OF THE PRESIDENT, PRESIDENT'S  
65 COUNCIL OF ADVISORS ON SCI. & TECH., FORENSIC  
66 SCIENCE IN THE CRIMINAL COURTS: ENSURING SCIENTIFIC  
67 VALIDITY OF FEATURE-COMPARISON METHODS 60 (Sept.  
68 2016) [hereinafter “PCAST REPORT”], [https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/PCAST/pcast\\_forensic\\_science\\_report\\_final.pdf](https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/PCAST/pcast_forensic_science_report_final.pdf).  
69 Scurich, Garrett & Thompson, *supra* note 12, at 3.  
70 The earliest ruling that we located, *Moughon v.*  
71 *State*, found that it was error to admit the testi-  
72 mony. 57 Ga. 102, 106 (1876). So did the Michigan  
73 Supreme Court in *Brownell v. People*, 38 Mich.  
74 732, 738 (1878). But see *Dean v. Commonwealth*,  
75 32 Gratt. 912, 927-28 (Va. 1879) (holding that it  
76 was not erroneous to admit firearms compari-  
77 son testimony); *Sullivan v. Commonwealth*, 93 Pa.  
78 284, 296-97 (1880) (same).  
79 *Commonwealth v. Best*, 62 N.E. 748 (Mass. 1902).  
80 *Id.* at 749-50.  
81 *Id.*  
82 *Id.*  
83 *People v. Berkman*, 139 N.E. 91, 94-95 (Ill. 1923).  
84 *Id.* at 94.  
85 *Id.*  
86 *Id.* (emphasis added).  
87 For a detailed account, see Heather Wolfram,  
88 *Teaching Forensic Science to the American Police*  
89 *and Public: The Scientific Crime Detection Labora-*  
90 *tory*, 1929-1938, 11 AC. FORENSIC PATHOLOGY 52, 55  
91 (2021).  
92 *Evans v. Commonwealth*, 19 S.W.2d 1091 (Ky.  
93 1929).  
94 *Id.* (emphasis added).  
95 The court compared Goddard's testimony to  
96 that of a lay witness, saying that “he could smell  
97 gasoline,” even though “the average man would  
98 have great difficulty in telling just how coal oil  
99 or gasoline smells, though acquainted with their  
100 odors.” *Id.*  
101 See, e.g., *Hampton v. People*, 465 P.2d 394, 400  
102 (Co. 1970) (stating there was no abuse of discre-  
103 tion for admitting a firearm comparison expert's  
104 testimony). For perhaps the first case referring to  
105 the discipline as a type of toolmark compari-  
106 son, see *United States v. Bowers*, 534 F.2d 186,  
107 193 (9th Cir. 1976).  
108 See, e.g., *Melcher v. Holland*, 2014 WL 31359, at  
109 \*13-14, \*16 (N.D. Cal. 2014) (finding no ineffective  
110 assistance of counsel highlighting it was correct  
111 to admit firearms evidence); *United States v.*  
112 *Sebborn*, 2012 WL 5989813, at \*7-8 (E.D.N.Y. 2012)  
113 (finding hearing unnecessary where other courts  
114 had examined reliability of firearms evidence).  
115 See, e.g., *Abuquah v. State*, 2020 WL 261722, at  
116 \*7-8 (Md. Ct. Spec. App., Jan. 17, 2020) (defense  
117 objections regarding methodology and expert  
118 conclusion language); *United States v. Mouzone*,  
119 687 F.3d 207, 215-17 (4th Cir. 2012) (defense objec-  
120 tions focused on expert allegedly violating limits  
121 imposed by judge on conclusion language).  
122 *United States v. Green*, 405 F. Supp. 2d 104 (D.  
123 Mass. 2005).  
124 *Id.* at 107.  
125 *Id.*  
126 *Id.*  
127 *Id.* (emphasis in original).  
128 *Id.* at 124.  
129 U.S. DEP'T OF JUST., UNIFORM LANGUAGE FOR TESTIMONY  
130 AND REPORTS FOR THE FORENSIC FIREARMS/TOOLMARKS DIS-  
131 CIPLINE PATTERN EXAMINATION 3 (2020), [https://www.](https://www.justice.gov/olp/page/file/1284766/download)  
132 [justice.gov/olp/page/file/1284766/download](https://www.justice.gov/olp/page/file/1284766/download).  
133 See NAT'L RSCH. COUNCIL OF THE NAT'L ACADS.,  
134 STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES:  
135 A PATH FORWARD (2009), <https://www.ojp.gov/pdffiles1/nij/grants/228091.pdf>.  
136 See *id.* at v-ix.  
137 *Id.* at 155.  
138 *Id.*  
139 *Id.* at 154.  
140 See *United States v. Cloud*, 576 F. Supp. 3d 827,  
141 842-43 (E.D. Wash. 2021) (“Such studies lack  
142 external validity, as examiners conducting real-  
143 world comparisons have neither the luxury of  
144 knowing a true match is somewhere in front of  
145 them nor of making process-of-elimination-type  
146 inferences to reach their conclusions.”).  
147 *Id.* at 3.  
148 PCAST REPORT, *supra* note 16, at 111.  
149 *Id.*  
150 David L. Faigman, Nicholas Scurich & Thomas  
151 D. Albright, *The Field of Firearms Forensics is*  
152 *Flawed*, SCI. AM. (May 25, 2022), <https://www.scientificamerican.com/article/the-field-of-firearms-forensics-is-flawed>.  
153 *United States v. Tibbs*, No. 2016 CF1 19431, 2019  
154 WL 4359486, at \*1 (D.C. Super. Ct. 2019).  
155 See *United States v. Adams*, 444 F. Supp. 3d 1248,  
156 1266 (D. Or. 2020) (concluding that it could not  
157 “find that the AFTE method enjoys ‘general  
158 acceptance’ in the scientific community”);  
159 *People v. Ross*, 68 Misc. 3d 899, 917 (N.Y. Sup. Ct.  
160 2020) (“[B]eyond comparing class characteris-  
161 tics forensic toolmark practice lacks adequate  
162 scientific underpinning and the confidence of  
163 the scientific community as whole.”); *United*  
164 *States v. Shipp*, 422 F. Supp. 3d 762, 775 (E.D.N.Y.  
165 2019) (“Even though prior decisions have found  
166 toolmark analysis to be reliable, it is incumbent  
167 upon this court to thoroughly review the cri-  
168 tiques of the AFTE Theory found in the NRC and  
169 PCAST Reports.”).  
170 *Shipp*, 422 F. Supp. 3d at 779.  
171 *U.S. v. Felix*, No. CR 2020-0002, 2022 WL  
172 17250458 (D.V.I. Nov. 28, 2022).  
173 Keith L. Monson, Erich D. Smith & Eugene M.  
174 Peters, *Accuracy of Comparison Decisions by*  
175 *Forensic Firearms Examiners*, 68(1) J. OF FORENSIC  
176 SCIS. 86, 86-100 (2023).  
177 Nicholas Scurich & Hal Stern, *Commentary on:*  
178 *Monson KL, Smith ED, Peters EM. “Accuracy of*  
179 *comparison decisions by forensic firearms exam-*  
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181 Scurich, N., David L. Faigman, & Thomas D.  
182 Albright, *Scientific guidelines for evaluating the*  
183 *validity of forensic feature-comparisons meth-*  
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187 *Re-analysis of Repeatability and Reproducibility*  
188 *in the Ames-USDOE-FBI Study*, 9(1) STATS. & PUB.  
189 POL'Y 175, 177 (2022).  
190 See *id.*  
191 See FIREARMS EXPERT EVIDENCE DATABASE, *supra* note 2;  
192 see e.g. *United States v. Davis*, No. 4:18-CR-00011,  
193 2019 WL 4306971, at \*4 (W.D. Va. Sept. 11, 2019).  
194 *United States v. Cazares*, 788 F.3d 956, 989 (9th  
195 Cir. 2015). See also *United States v. Taylor*, 663 F.  
196 Supp. 2d 1170 (D.N.M. 2009); *United States v. Ash-*  
197 *burn*, 88 F. Supp. 3d 239, 249 (E.D.N.Y. 2015); *Unit-*  
198 *ed States v. Love*, No. 2:09-cr-20317-jPM (W.D.  
199 Tenn. Feb. 8, 2011) (excluding testimony with  
200 conclusions of absolute or practical certainty).  
201 *United States v. Diaz*, No. CR 05-00167 WHA,

- 2007 WL 485967, at \*1 (N.D. Cal. Feb. 12, 2007).  
62 See *United States v. Glynn*, 578 F. Supp. 2d 567, 574–75 (S.D.N.Y. 2002) (limiting testimony to “more likely than not” conclusion).
- 63 U.S. DEP’T OF JUST., UNIFORM LANGUAGE FOR TESTIMONY AND REPORTS FOR THE FIREARMS/TOOLMARK DISCIPLINE PATTERN ANALYSIS 3 (2020), <https://www.justice.gov/olp/page/file/1284766/download>.
- 64 *Id.*
- 65 See, e.g., *United States v. Monteiro*, 407 F. Supp. 2d 351, 372 (D. Mass. 2006) (permitting an examiner to opine that “class characteristics were in complete agreement,” but only to a “reasonable degree of ballistic certainty,” with no further probabilistic conclusions).
- 66 *United States v. Sutton*, No. 2018 CF1 009709 (D.C. Sup. Ct. May 9, 2022) (permitting the examiner to opine “that the ammunition at issue is consistent with being fired from the same firearm”).
- 67 *United States v. Shipp*, 422 F. Supp. 3d 762, 783 (E.D.N.Y. 2019).
- 68 *United States v. Tibbs*, No. 2016 CF1 19431, 2019 WL 4359486, at \*22 (D.C. Super. Ct. 2019).
- 69 *United States v. Willock*, 696 F. Supp. 2d 536, 546 (D. Md. 2010), *aff’d sub nom. United States v. Mouzone*, 687 F.3d 207 (4th Cir. 2012) (emphasis added).
- 70 *Abruquah v. State*, 483 Md. 637, 648 (2023).
- 71 See, e.g., *United States v. Adams*, 444 F. Supp. 3d 1248, 1265 (D. Or. 2020); see also, e.g., *People v. Ross*, 68 Misc. 3d 899, 918 (N.Y. Sup. Ct. 2020) (“The People may proffer their NYPD ballistics examination for the testimony on class characteristics as described above.”).
- 72 *Adams*, 444 F. Supp. 3d at 1266.
- 73 FED. R. EVID. 702 (requiring that an expert be “qualified . . . by knowledge, skill, experience, training, or education”).
- 74 *United States v. Cloud*, 576 F. Supp. 3d 827 (E.D. Wash. 2021).
- 75 *Id.* at 844.
- 76 Forensic Service Provider Accreditations, AN-SI-ASQ NAT’L ACCREDITATION Bd., <https://anab.ansi.org/accreds/accreditation-for-forensic-service-providers> (last visited Aug. 15th, 2023).
- 77 See generally Brandon L. Garrett & Gregory Mitchell, *The Proficiency of Experts*, 166 U. PA. L. REV. 901 (2018).
- 78 FED. R. EVID. 702(c).
- 79 See, e.g., *United States v. Monteiro*, 407 F. Supp. 2d 351, 351 (D. Mass. 2006).
- 80 See *United States v. Tucker*, 18 CR 0119 (SJ), 2020 WL 93951, at \*3 (E.D.N.Y. Jan. 8, 2020).
- 81 *Ricks v. Pauch*, No. 17-12784, 2020 WL 1491750, at \*18 (E.D. Mich. Mar. 23, 2020).
- 82 *United States v. Chavez*, No. 15-CR-00285-LHK-1, 2021 WL 5882466, at \*5 (N.D. Cal. Dec. 13, 2021).
- 83 See *People v. Winfield*, No. 15-CR-1406601, at 32–34 (Cir. Ct. Cook Cnty. Ill. Feb. 8, 2023).
- 84 See Memorandum from the chair of the Committee on Rules of Practice and Procedure, *supra* note 3.
- 85 *Id.* at 230.
- 86 *Id.* at 230.

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