

SUPERIOR COURT OF THE DISTRICT OF COLUMBIA  
CRIMINAL DIVISION – FELONY BRANCH

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2016 CF1 002267  
Hon. Judith Bartinoff

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UNITED STATES OF AMERICA

v.

BENITO VALDEZ,

Defendant.

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**GOVERNMENT’S OPPOSITION TO DEFENDANT’S MOTION TO  
EXCLUDE FIREARM AND TOOLMARK TESTIMONY**

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**SUPERIOR COURT OF THE DISTRICT OF COLUMBIA  
Criminal Division – Felony Branch**

<b>UNITED STATES</b>	:	<b>Case No. 2016 CF1 002267</b>
	:	
v.	:	<b>Hon. Judith Bartinoff</b>
	:	
<b>BENITO VALDEZ</b>	:	

**GOVERNMENT’S OPPOSITION TO DEFENDANT’S MOTION TO  
EXCLUDE FIREARM AND TOOLMARK TESTIMONY**

On May 30, 2017, defendant Benito Valdez (“defendant”) filed a motion to exclude firearm and toolmark testimony pursuant to the newly adopted Rule 702 and Daubert v. Merrell Dow Pharm. Inc., 509 U.S. 579 (1993). The crux of defendant’s argument is that the issuance of three reports – 1) National Research Council’s Committee on Assessing the Feasibility, Accuracy, and Technical Capability of a National Ballistics Database, *Ballistic Imaging* (“2008 Ballistics Imaging Report”); 2) the National Research Council, Committee on Identifying the Needs of the Forensic Science Community, *Strengthening Forensic Science in the United States: A Path Forward* (“2009 NAS Report”), and 3) *Report to the President Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods* (“PCAST Report”) – support the exclusion altogether of firearms and toolmark identification testimony at trial. Glaringly absent from defendant’s pleading is a single case that any of these three reports supports suppression of firearms evidence, or any form pattern matching evidence for that matter. More importantly, defendant ignores the plethora of case law here and throughout the country soundly rejecting such a request.

As we demonstrate below, the 2008 Ballistics Imaging Report is simply not germane and efforts to exclude firearms based upon the 2009 NAS Report are outdated and have been rejected

by every judge of this Court that has ruled on the issue as well as the D.C. Court of Appeals under the Frye standard. Judges of this Court and the Court of Appeals have similarly rejected claims based upon the 2009 NAS Report to suppress other forms of pattern matching evidence, such as latent fingerprint identification and handwriting evidence, under the Frye standard as well. Defendant asserts that the adoption of the Daubert admissibility standard gives new life to these recycled claims. Defendant's position, however, ignores local and federal case law throughout the country admitting firearms and other forms of pattern matching evidence under Daubert after the issuance of the 2009 NAS Report. There are no cases to the contrary.<sup>1</sup>

Firearms examiners use the AFTE Theory of Identification. Courts that have examined the five factors set out by the Supreme Court in Daubert, have universally concluded that firearms identifications based upon this theory should be admitted. Of Course, the D.C. Court of Appeals has already ruled on one of these factors – general acceptance – in admitting firearms evidence under the Frye standards. Moreover, before and after the issuance of the 2008 Ballistic Imaging Report and 2009 NAS Report, Courts have concluded that the AFTE Theory of Identification satisfies the other factors enumerated by the Supreme Court in Daubert, *i.e.*, testability, peer-review, acceptably low error rate, and standards controlling the technique's operation.

Everything that has transpired since this Court and the Court of Appeals last ruled on this issue favors admission, not exclusion, of firearms and toolmark identification evidence. One of the biggest criticisms of firearms and toolmark identification is the subjective nature of the AFTE theory of identification. Over the past few years, there has been a considerable amount of peer-review scientific literature supporting the future use of three-dimensional imaging combined with

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<sup>1</sup> Defendant's pleading cites numerous cases that simply have no application to the admissibility of firearms evidence. Moreover, other materials relied upon by the defendant are either altogether irrelevant or do nothing to undermine the admissibility of firearms and toolmark identification evidence.

sophisticated computer algorithms to quantify and replicate the firearms identification process. Moreover, there has been considerable peer-reviewed scientific literature outlining the future development of firearms population databases (like the human population databases in DNA) to support the application of statistical models to a firearms identification. To date, none of the peer-reviewed literature has refuted the claims made by the firearms community for over a century, *i.e.* that a trained firearms examiner can identify a cartridge case or bullet to a specific firearm with a very high degree of accuracy. In other words, the ability of humans to match cartridge cases and bullets to a particular firearm has been supported in objective empirical data – a fact overlooked by PCAST and the defendant.

The PCAST Report provides nothing to undermine the admissibility of firearms and toolmark identification evidence. As discussed below, rather than evaluate scientific disciplines under the criteria set forth in Daubert, PCAST proposes a limited standard for admissibility by focusing on a single criterion, *i.e.*, validation. Most problematically, this arbitrary standard is scientifically lacking insofar as it ignores huge bodies of scientific validation. Moreover, the universe of validation data reviewed by PCAST were without transparency, not subjected to peer-review, and riddled with basic mathematical errors. Not surprisingly, this approach has not been embraced by leaders throughout the various forensic disciplines.<sup>2</sup> As noted by Dr. Bruce Budowle,

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<sup>2</sup> This is not the first time PDS has attempted to suppress forensic evidence based upon a scientific report co-authored by Eric S. Lander. In the early 2000s, PDS moved to exclude DNA evidence on the grounds there was a raging debate within the scientific community over the proper statistical calculations to express the significance of a DNA cold hit. In support of this claim, PDS relied upon the 1992 National Research Council Report on DNA (NRC I). The trial judge initially suppressed the government's DNA evidence on the grounds that there was a raging debate within the scientific community over the proper statistic to reflect the probative value of a cold hit. The Court of Appeals reversed noting, *inter alia*, that the recommendations of the 1992 NRC I were not part of the scientific debate because the recommendations in that report were “no longer accepted or followed by the relevant scientific community.” United States v. Jenkins, 887 A.2d 1013, 1022 n.17 (D.C. 2005),

the most published forensic geneticist in the world, the PCAST Report itself would *not* have survived the very peer-review process advocated by its authors and missed the mark on its evaluation of DNA, the “gold standard” of forensics. See Budowle Statement (Attachment I). Dr. Budowle’s critique is echoed by Dr. John Buckleton, another renowned and widely published geneticist who was one of the developers of the probabilistic genotyping software (STR-mix) validated by laboratories throughout the country – including the FBI and the D.C. Department of Forensic Sciences (DFS). See Buckleton Statement (Attachment II). Although Dr. Budowle was initially going to publish on the topic of the PCAST Report, he decided against it when it became apparent that scientific leaders were not paying much attention to the recommendations contained therein. In evaluating the overall impact of the report on the scientific community, Dr. Budowle does not mince words: “the PCAST Report 1) is **not** scientifically sound, 2) is **not** based on data, 3) is **not** well-documented, 4) misapplies statistics, 5) is full of inconsistencies, and 6) does **not** provide helpful guidance to obtain valid results in forensic analyses.” Budowle Statement at 12 (emphasis in original).

The shortcomings of the PCAST Report are particularly revealing with respect to firearms and toolmark identification. PCAST implores the forensic community to completely ignore judgment and experience and focus only on one factor, validation. Yet, the PCAST Committee ignored a vast body of validation involving the use of the AFTE Theory of Identification by

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reversed on other grounds, 75 A.3d 174 (D.C. 2013). In fact, the recommendations of the NRC I were so lacking in scientific support that the National Academy of Sciences commissioned a second NRC only four years later in 1996 – known as the NRC II – to correct the many flawed recommendations in the report co-authored by Lander and establish recommendations grounded in sound science. Ironically, Dr. Budowle – who is highly critical of the PCAST Report for its lack of scientific grounding – was also highly critical of the NRC I as well as the position taken by PDS in Jenkins.

firearms examiners. What little analysis was conducted by PCAST is riddled with errors. PCAST also ignored the vast body of peer-review literature involving three-dimensional imaging with sophisticated computer algorithms and the application of statistical modeling through firearms population databases. See Statement of Todd Weller (Attachment III).<sup>3</sup> Not surprisingly, courts that have addressed the PCAST Report have denied requests to suppress firearms identifications and other forms of pattern matching evidence.

The infeasibility of the PCAST approach is apparent when attempting to apply such a rigid, myopic approach to other scientific disciplines such as a medical diagnosis. In obtaining a diagnosis, a patient would never expect a physician to ignore judgement, experience, and potentially critical research in making a diagnosis. Under the PCAST approach, a doctor might have to tell a patient, “my judgment and experience combined with a century of foundational research and validation informs me that you likely have a carcinoma requiring radiation treatment, but since the research does not comply with PCAST’s rigid validation requirements, I’m going to ignore my judgment, experience, and all data available to me and not do anything about your medical condition.” Dr. Budowle chides PCAST for recommending an approach for forensics that would never be accepted by other scientific disciplines.

Over the past century, no court in this jurisdiction, or anywhere else for that matter, has excluded firearms and toolmark identification testimony. Since this Court and the Court of Appeals last ruled in favor of admitting firearms and toolmark identification evidence, the field has continued to embrace further validation and advancements, including, most recently, the development of three-dimensional imaging and computer algorithms that provide objective

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<sup>3</sup> Articles cited in the Budowle and Weller statements contain links or have electronic copies attached to those statements.

empirical support for identifications based on markings left on bullets and cartridge cases. Firearms and toolmark analysis meets all of the standards articulated in Daubert. Thus, there is no scientific or legal basis to exclude firearms and toolmark identification evidence. Accordingly, this Court should deny defendant's motion to exclude firearms and toolmark identification testimony without a hearing.

Lastly, defendant alternatively requests that the Court "should limit the examiner to pointing to the similarities he sees between the pieces of ballistic evidence, as well [sic] any differences identified, leaving it to the jury to determine, for instance, whether or not it should find that the four .22 caliber bullets were fired from the same gun." Defendant cites absolutely no support for such a limitation. More importantly, defendant's request is outdated and ignores recent D.C. Court of Appeals authority limiting firearms examination conclusions consistent with current U.S. Attorney's Office policy.

## **BACKGROUND**

### **I. Facts**

The defendant is charged, by indictment, with first-degree murder while armed and kidnapping. These charges arise out of the defendant's actions on or about April 22<sup>nd</sup> and 23<sup>rd</sup> 1991, which culminated in a shooting in Langdon Park, near the 1800 block of Franklin Street, Northeast, at approximately 1:30 a.m. During the shooting, Curtis Pixley, Samantha Gillard, and Keith Simmons were each shot multiple times. All three victims died and their bodies were discovered laying on the ground, side-by-side and faced-down.

## II. MPD Firearms Report

On March 26, 2007, Firearms and Toolmark Examiner Travis Spinder issued a report on behalf of the MPD Firearms Unit. See March 26, 2007 MPD Report (Attachment IV). The report contained the following conclusions:

- Item #1 is a Glock, caliber 9mm Luger semiautomatic pistol, model 17, serial number MP2341DC. This firearm is the property of the Metropolitan Police Department and is issued to Officer Duane Fowler. Item #1 was found to be in normal operating condition. All safety design mechanisms are intact and functional.
- Items #5, #14, #51, #58, #60, #61, #69A, #69B, and #69C are three (3) caliber 9mm Luger copper jacketed bullets and six (6) nickel jacketed bullets which were identified as having been fired from the same barrel rifled with six (6) grooves, right twist. Due to differences in rifling characteristics, Items #5, #14, #51, #58, #60, #61, #69A, #69B, and #69C could not have been fired from Item #1 pistol. Among the firearms, which may produce similar rifling impressions are caliber 9mm Luger pistols marketed by Astra, Beretta, Hi-Point, Intratec, Jennings and Taurus.
- Items #6 through #9 and #15 through #23 are thirteen (13) caliber 9mm Luger cartridge cases, Winchester and Remington brands, which were identified as having been fired in the same firearm. Due to differences in rifling characteristics, Items #6 through #9 and #15 through #23 could not have been fired from Item #1 pistol.
- Items #48, #50, #59, #70 are four (4) caliber .22 lead bullets which were identified as having been fired from the same barrel rifled with eight (8) grooves, right twist. Among the firearms, which may produce similar rifling impressions are caliber .22 revolvers and pistols marketed by Arminius, Cooney Arms Lorein, Mossberg, RG, Rohm, Tanfoglio and Walther.
- Items #11, #49, #62, and #69D consist of ten (10) lead fragments, seven (7) nickel jacket fragments and two (2) copper bullet fragments which have no identifiable characteristics.
- Item #69D consists of two (2) lead bullet cores, which is consistent with having separated from its jacket.

Mr. Spinder is expected to testify to the above conclusions that were reached using the AFTE Theory of Identification and his nearly twenty years of experience as a firearms and toolmark examiner. As indicated on his attached curriculum vita, Mr. Spinder has been a leader in the scientific community. Among his many accomplishments, he served on the Scientific

Working Group for Firearms and Toolmarks (SWGgun) for six years and is the current President of the Association of Firearm and Tool Mark Examiners (AFTE). See Travis Spinder CV (Attachment V). In addition, Mr. Spinder has a number of peer-reviewed publications and scientific presentations in the area of firearms and toolmark analysis. Id.

### **III. Firearms and Toolmark Identification<sup>4</sup>**

Firearm identification has been a forensic discipline since the 1920s. See The History of Firearm and Toolmark Identification, AFTE Journal, 1999 Volume 31, Number 3 (Summer), Page 266 thru 284. Firearms identification is a subset of the broader forensic discipline known as toolmark identification. Toolmark examiners are trained to examine the marks left by tools on any variety of surfaces in an attempt to associate or “match” a toolmark to a particular tool that made the mark. Firearms are simply a subset of tools that impart marks on bullets and cartridge cases as firearms are essentially considered a specialized tool. See AFTE.org/resources/swggun-ark, Foundational Overview of Firearm/Toolmark Identification.

A firearm imparts different types of marks on the various components of a cartridge. With respect to bullets, cuts within a gun barrel (“grooves”) and raised surfaces (“lands”) create corresponding depressed “land impressions” and raised “groove impressions” as bullets travel through a barrel. The twist imparted on a bullet can be either left or right, depending on the

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<sup>4</sup> *The contents of this section is largely based on a series of affidavits previously authored by firearms and toolmark expert Stephen Bunch (formerly the Unit Chief with the FBI Firearms/Toolmark Unit) dated May 29, 2008, July 8, 2008, and June 5, 2009, in connection with Frye litigation in the District of Columbia. (Attachment VI). After Mr. Bunch left the FBI, these affidavits were reviewed and affirmed by FBI Firearms Analyst Douglas Murphy on July 9, 2010. (Attachment VII). This section was also reviewed and edited by current members of the FBI Firearms/Toolmark Unit as well as Greg Klees, a firearms and toolmark expert at the Bureau of Alcohol, Tobacco, Firearms, and Explosives and John Murdock, a firearms and toolmark contractor with the Contra Costa County Office of the Sheriff, Forensic Services Division, Martinez, CA. Their collective tutelage was instrumental in laying the proper foundation for this pleading.*

direction of the lands and grooves. With respect to cartridge casings, contact between the cartridge and the breech create “breech face marks,” and the impact of the firing pin on the primer creates a “firing pin impression” on the primer itself. The working edges of tools, which include components of firearms that contact ammunition, generally consist of some type of hard material, such as steel, to ensure strength and durability of the tool while work pieces are generally made of softer materials. These surfaces of a tool that contact a material contain random, microscopic irregularities that are produced during the tool's manufacture and/or subsequent wear through use and abuse. These irregularities, which are formed randomly, can individualize or distinguish one tool from another. Because these irregularities or individual characteristics are typically imparted onto the work piece, the comparative study of the imparted markings allow the tool to be individually associated or identified as having produced the mark. The presence, observation, and comparison of these random toolmarks on tools form the hypothetical propositions upon which the discipline of Toolmark Identification is based.

Firearm and toolmark identification is based upon two testable propositions:

Proposition #1:

Toolmarks imparted to objects by different tools will rarely if ever display agreement sufficient to lead a qualified examiner to conclude the objects were marked by the same tool. That is, a qualified examiner will rarely if ever commit a false positive error (misidentification).

Proposition #2:

Most manufacturing processes involve the transfer of rapidly changing or random marks onto work pieces such as barrel bores, breech faces, firing pins, screwdriver blades, and the working surfaces of other common tools. This is caused principally by the phenomena of tool wear and chip formation or by electrical/chemical erosion. Microscopic marks on tools may then continue to change from further wear, corrosion, or abuse.

See Bunch S., Smith E, Grioux B., and Murphy D., Is a Match Really a Match? A Primer on the Procedures and Validity of Firearm and Toolmark Identification, Forensic Science

Examiners are trained to recognize and evaluate the following characteristics: (1) class characteristics; (2) subclass characteristics; and (3) individual characteristics. Class characteristics are predetermined during the manufacturing process, such as caliber, number of land and grooves, etc. For a fired bullet, class characteristics include the number of land and groove impressions, the direction of twist of the land and groove impressions, and the width of the land and groove impressions. For a fired cartridge case, class characteristics are typically limited to the firing pin impression on the primer, which can appear in various shapes, including circular, rectangular, hemispherical, and elliptical, and to the shape of the firing pin aperture and the type of breach face impression, which can be in different shapes and orientations, e.g. arched, circular, parallel, etc. These are measurable features of a specimen, which indicate a restricted group source. They result from design factors and are determined prior to manufacture. See AFTE Glossary, 6<sup>th</sup> ed.

Subclass characteristics are more restrictive than class characteristics and are consistent among items manufactured by the same tool in the same approximate state of wear. See AFTE Glossary, 6<sup>th</sup> ed. These characteristics can exist within a particular production run in the manufacturing process and occasionally arise from (1) imperfections in a machine tool that persist during the production of multiple firearm components; or (2) extreme hardness differences between the machine tool and the workpieces. Qualified examiners are trained to distinguish subclass characteristics from individual characteristics because identifications may not be made from subclass characteristics.

Individual characteristics, on the other hand, consist of microscopic, random imperfections in the barrel or firing mechanism created by the manufacturing process, wear, corrosion, or abuse. Individual characteristics are unintended microscopic features that occur due to machining process

and random chip formation during manufacturing. Individual characteristics typically fall into two categories: (1) striated marks made by movement of a fired bullet through a gun's barrel (typically appearing as scratches or striations), and (2) impressed marks that are pressed into a surface. A fired bullet usually has striated marks. A spent cartridge case, on the other hand, can have both impressed and striated marks. Before firing, the process of feeding the cartridge into the chamber can create striated marks. Once the firearm is fired, striated marks also can be imparted to the cartridge case wall (side), and impressed marks are imparted to the cartridge case by the gun's firing pin and breech. With semi-automatic weapons, additional marks can be made as the cartridge case is expelled from the gun. Marks produced by the random imperfections or irregularities of tool surfaces are produced incidental to manufacture and/or caused by use, corrosion, or damage. See AFTE Glossary, 6<sup>th</sup> ed. In general, the tool working surfaces in a firearm can slowly change over time from wear and may leave different marks on bullets and casings. As microscopic similarities diminish, the likelihood of an inconclusive result increases, but the likelihood of a false positive should remain unchanged.

Since the inception of firearms and toolmark identification as a forensic discipline, firearms examiners have been using a method known as "pattern matching" to determine whether sufficient similarity exists between toolmarks to warrant a conclusion that two bullets or two cartridge cases came from the same firearm. In 1992, AFTE memorialized the Theory of Identification in an attempt to explain the basis of opinions of common origin in toolmark comparisons:

1. The theory of identification as it pertains to the comparison of toolmarks enables opinions of common origin to be made when the unique surface contours of two toolmarks are in "sufficient agreement."
2. This "sufficient agreement" is related to the significant duplication of random toolmarks as evidenced by a pattern or combination of patterns of surface contours. Significance is determined by the comparative examination of two or more sets of surface contour patterns comprised of

individual peaks, ridges and furrows. Specifically, the relative height or depth, width, curvature and spatial relationship of the individual peaks, ridges and furrows within one set of surface contours are defined and compared to the corresponding features in the second set of surface contours. **Agreement is significant when agreement in individual characteristics exceeds the best agreement demonstrated between toolmarks known to have been produced by different tools and is consistent with agreement demonstrated by toolmarks known to have been produced by the same tool.** 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.*

3. Currently the interpretation of individualized/identification is subjective in nature, founded on scientific principles and based on the examiner’s training and experience.

See AFTE Criteria for Identification Committee. Theory of Identification, Range of Striae Comparison Reports and Modified Glossary Terms – An AFTE Criteria for Identification Committee Report, AFTE Journal, 1992, 24 (3): 336-340 (emphasis supplied) and AFTE Glossary 6<sup>th</sup> Edition 2013 at 136.

The discipline of firearm and toolmarks identification follows a recognized examination methodology involving two phases of analysis. The first phase focuses around the objective evaluation of the existing class characteristics, if similar, the examination moves to the second phase involving the comparative microscopic evaluation of individual characteristics that culminates with an opinion decision concerning sufficient agreement, which is subjective. This outlines the levels of analysis firearm and toolmark examiners follow to determine a common source:

### **1. Evaluation: (Objective)**

The initial examination phase evaluates evidence to determine if the observed class characteristics are the same between two specimens (two unknown specimens, or an unknown and

a known specimen). If the specimens are suitable for examination and the class characteristics are the same, then it is possible that the toolmarks were produced utilizing the same tool (such as a firearm). If they are different, then the two specimens can be eliminated as having been produced by the same tool.

## **2. Comparison: (Subjective – Pattern Matching)**

If the class characteristics are consistent between two specimens, then a comparative examination is performed utilizing a comparison microscope. The methodology utilized in the examination process is pattern matching. This comparison is conducted to determine: 1) if any marks present are subclass characteristics and/or individual characteristics, and 2) the level of correspondence of any individual characteristics.

## **3. Conclusion:**

If sufficient agreement of individual characteristics is observed between two specimens, an identification conclusion is rendered. If all of the discernible class characteristics are the same, but sufficient agreement of the individual characteristics is not observed, an inconclusive result is rendered.<sup>5</sup> In some situations, an elimination conclusion may be rendered based on observed differences in individual characteristics.

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<sup>5</sup> The AFTE Glossary (6<sup>th</sup> Edition) describes three subcategories of inconclusive results: A) Agreement of all discernible class characteristics and some agreement of individual characteristics, but insufficient for an identification. B) Agreement of all discernible class characteristics without agreement or disagreement of individual characteristics due to an absence, insufficiency or lack of reproducibility. C) Agreement of all discernible class characteristics and disagreement of individual characteristics, but insufficient for an elimination.

#### 4. Verification:

A verification process is employed to ensure proper conclusions are rendered. As outlined in a laboratory's quality assurance policy, a mechanism should be in place to determine which cases will require verification. Many laboratories (such as DFS and its predecessor MPD) require verification of all identifications. See [afte.org/resources/swggun-ark/summary-of-the-examination-method](http://afte.org/resources/swggun-ark/summary-of-the-examination-method).

Using this methodology for examining toolmarked surfaces, there are four conclusions that examiners reach when conducting an examination: (1) identification, (2) inconclusive, (3) elimination, and (4) unsuitable for comparison. Examiners undergo standardized technical training designed to develop cognitive skills to recognize patterns of individual characteristics necessary to make an identification. However, there is no way to be *absolutely* (100%) certain of any identification without comparing a particular set of marks to marks created by every firearm produced since the invention of the modern day firearm (an impossible endeavor). Thus, an examiner cannot rule out with absolute certainty the highly unlikely event that two different firearms will produce indistinguishable individual characteristics. To date, such an occurrence, however, remains theoretical.

As discussed below, the field of forensic firearm and toolmark identification continues to undergo testing in the form of (1) technical research; (2) validation studies; and (3) proficiency testing. Validation studies are the most comprehensive way to test and validate firearms and toolmark identification as a reliable forensic science. These tests involve “ground truth,” so it is known with absolute certainty where each of the test components came from. Using the same methods and identification criteria as those in actual casework, qualified examiners have consistently reached correct conclusions with exceptionally low error rates. Even where

researchers have studied bullets and cartridge cases fired from consecutively manufactured firearms – where the possibility of a false-positive conclusion is at its highest – trained examiners have been able to readily distinguish marks produced by the various firearms.

#### IV. Testimony by Firearms Examiners

Citing the 2008 Ballistic Imaging Report, defendant argues that “examiners regularly presented statements of unqualified certainty when declaring that ammunition matched a firearm” and tend to “cast their assessments in bold absolutes, commonly asserting that a match can be made ‘to the exclusion of all other firearms in the world.’” Defendant’s Motion at 15. This was not an accurate statement of firearms testimony nearly a decade ago when PDS first moved to exclude firearms and toolmark identification testimony, and it remains inaccurate today.<sup>6</sup> To be clear, as discussed in detail below, it is not the policy of the United States to elicit identifications of *absolute (100%) certainty* or to have experts make identifications of a cartridge case or a bullet to a firearm *to the exclusion of all other firearms*. Moreover, when a firearms examiner identifies a case or a bullet to known exemplar, the identification will not be qualified by the expression “to a reasonable scientific certainty.”<sup>7</sup>

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<sup>6</sup> For example, in United States v. William N. McCorkle et. al., 2008 CF1 17877 (Judge Lynn Leibovitz), in opposition to a motion to exclude firearms and toolmark testimony, the United States made it clear that it was the policy of the United States Attorney’s Office not to elicit conclusions couched in terms of absolute certainty. Consistent with recommendations from leaders within the scientific community, the United States conceded that “there is no way to be absolutely (100%) certain of any identification without comparing a particular set of marks to marks created by every firearm produced since the invention of the modern day firearm. Such an endeavor is impossible.” Government’s Opposition at 30 citing 2008 Bunch Decl. Para. 26.

<sup>7</sup> On September 6, 2016, Attorney General Loretta E. Lynch directed Department components to implement policies designed to strengthen forensic practices, including the following:

Department forensic laboratories will review their policies and procedures to ensure that forensic examiners are not using the expressions “reasonable scientific certainty” or “reasonable [forensic discipline] certainty” in their

Firearms evidence has been admitted in American courts for over a century. The manner in which firearms examiners articulate an identification of a cartridge case or bullet to a known exemplar has been an evolving process. Historically, many firearms examiners made identifications in absolute terms to the exclusion of all others. However, as the firearms and toolmark community evolved and embraced language that would not overstate the significance of a firearms identification under the AFTE Theory of Identification, the U.S. Attorney's Office implemented policies in accordance with these recommendations. By 2008, the United States Attorney's Office had already abandoned the practice of eliciting identifications of absolute certainty from experts in various pattern-matching disciplines, such as latent fingerprint identification and firearms and toolmark identification.<sup>8</sup> As discussed supra, over the past decade the firearms and toolmark community has devoted significant resources to laying the groundwork for the implementation of statistical calculations that will provide fact finders with the chance of selecting another firearm at random that could display similar individual characteristics. Until the community is finished laying the groundwork for these statistical calculations, the U.S. Attorney's Office will continue to follow the recommendations of the leaders within the scientific community to ensure that its examiners are not overstating or understating firearms conclusions.

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reports or testimony. Department prosecutors will abstain from use of these expressions when presenting forensic reports or questioning forensic experts in court unless required by a judge or applicable law.

See November 6, 2016 AG Memo for Head of Department Components at 1. Thus, undersigned counsel will not elicit a conclusion couched in these terms.

<sup>8</sup> In the pattern matching discipline of firearms and toolmark identification, the Court of Appeals recently reaffirmed that it is permissible for "toolmark experts to offer an opinion that a bullet or shell casing was fired by a particular firearm," but noting that they are not permitted to do so "with absolute or 100% certainty." Gardner v. United States, 140 A.3d 1172, 184 n.19 (D.C. 2016). The Court in Gardner noted that the United States conceded error in eliciting an opinion of absolute or 100% certainty and, instead, argued harmless error which the Court found. Id. at 1182-86.

On December 2, 2014, the FBI issued Approved Standards for Scientific Testimony and Report Language for the Firearms/Toolmarks Discipline (ASSTR). (Attachment VIII). It is the policy of the U.S. Attorney's Office and the firearms examiners sponsored by the prosecution to follow the FBI ASSTR. Set forth below is the FBI ASSTR in its entirety:

## **1 Purpose**

This document provides examples of the scientifically-supported conclusions and opinions approved for reporting examination conclusions and offering expert opinion statements during testimony by Firearms/Toolmarks Examiners within the Firearms/Toolmarks Unit (FTU). It is noted that these examples are not intended to be all inclusive and may be dependent upon the precedent set by the judge or locality in which a testimony is provided. Further, these examples are not intended to serve as precedent for other forensic laboratories and do not imply that statements by other forensic laboratories are incorrect, indefensible, or erroneous.

## **2 Scope**

This document applies to the FTU employees who prepare an FBI Laboratory *Report of Examination* (7-1, 7-1 LIMS) and/or provide testimony.

## **3 Responsibilities**

**3.1** The Examiner will ensure that a *Report of Examination* is consistent with the approved language contained within this document.

**3.2** The examiner will ensure that his/her testimony related to firearms/toolmarks examination is consistent with the standards contained in this document.

**3.3** The Unit Chief, Technical Leader or designee will ensure compliance of Firearms/Toolmarks Unit *Reports of Examination* with the statements contained within this document.

**3.4** The Unit Chief, Technical Leader or designee will assess if FTU examiner testimony complies with the statements contained within this document.

## **4 Statements Approved for FBI FTU Unit Examination Testimony and/or Laboratory Reports**

### **4.1 Identification**

An examiner may state or imply the result of an examination as an *identification* when the comparison of the microscopic marks are in sufficient agreement to conclude they originated or were created from the same individual source. Sufficient agreement is related to the significant duplication of random toolmarks as evidenced by the correspondence of a pattern or combination of patterns of surface contours. Agreement is significant when the agreement in the microscopic marks exceeds the best agreement demonstrated between toolmarks known to have been produced by different tools and consistent with agreement demonstrated by toolmarks known to have been produced by the same tool. When sufficient agreement exists between two toolmarks, the agreement of the microscopic marks is of a quantity and quality that the likelihood another tool could have produced the same mark is so remote as to be considered a practical impossibility.

### **4.2 Exclusion**

An examiner may state or imply the result of an examination is an *exclusion* when there is a discernible or measurable difference in class characteristics.

### **4.3 Inconclusive**

If the conditions required for an Identification or Exclusion are not observed, an examiner may state or imply that the result of an examination is inconclusive.

## **5 Statements Not Approved For FBI FTU Examination Testimony and/or Laboratory Reports**

### **5.1 Absolute Certainty**

An examiner may not state or imply that a toolmark was created by a specific tool to absolute certainty or to the exclusion of all other tools in the world.

### **5.2 Numerical Certainty**

An examiner cannot assign a numerical degree of certainty nor provide a precise error rate to a toolmarks identification.

## **6 Laboratory Report Reviews**

The content of a FTU *Report of Examination* will be reviewed per the *FBI Firearms/Toolmarks Unit Procedures for Case Assignment, Records, Report Writing and Review* ensuring compliance with the approved statements in this document.

## **7 Testimony Reviews**

FTU examiner testimonies will be reviewed following the *FBI Laboratory Practices for Court Testimony Monitoring*. The review will ensure compliance with the statements in this document.

The above ASSTR provides a rough outline for how the firearms examiner will convey his conclusions and what type of verbiage will be avoided. The goal is to communicate the examiner's conclusions to the jury without overstating or understating the probative nature of his conclusions. Moreover, while it is impossible to predict what questions or issues will arise on cross-examination, the United States puts the defense on notice that the following questions are likely to elicit the following responses:

If the prosecution's expert is asked on cross-examination how certain he is about his conclusion, the expert will explain that he will not make an identification unless he has seen "sufficient agreement" in the markings to cause him to be highly confident in his conclusion.

If asked whether he could have made a mistake, the prosecution expert will acknowledge that – like all humans -- he is capable of making mistakes, but is highly confident in his conclusion in this case and confident that any other qualified expert would reach the same conclusion.

If asked whether it is possible that another firearm could have made the markings observed on the evidence item, the prosecution's expert will: 1) remind the jury that firearms experts are trained to distinguish between markings produced on

consecutively produced firearms by manufacturers; and 2) to date, firearms examiners have not identified any guns manufactured by different manufacturers that coincidentally produced indistinguishable Individual/random Characteristics that could lead a firearms examiner to make a false identification – such a possibility remains theoretical.

To the extent the defense suggests or implies that the prosecution's expert has been biased (by being exposed to task irrelevant information), the government – with the permission of the Court – will illicit that the defense had the right to have a qualified expert independently examine the evidence. See Corbin v. United States, 120 A.3d 588, 604 (D.C. 2015) (“suggestions of bias open the door [to a defendant's right to independently test the evidence.]”).

**V. Research to Support the Application of Statistical Analysis Three-dimensional Topographical Imaging Combined with Computer Algorithms and the Creation of Firearms Population Databases to Support the Application of Statistical Analysis to the Field of Firearms and Toolmark Analysis**

Currently, firearms examinations in crime laboratories throughout the United States and elsewhere are performed manually using comparison microscopes and involve the subjective judgment of a firearms examiner. The subjective aspect of firearms analysis has come under attack in recent years. However, the application of the field of surface topography measurement to the firearms and toolmark identification “has a promising future with a vision that one day investigations and firearm identifications might be accomplished or affirmed through automated searches and matches using topography data from the surfaces of the ballistics evidence.” Vorburger, et. al., Topography measurements and applications in ballistics and tool mark identifications, Surf. Topogr.: Metrol. Prop. 4 (2016) at 2. Because these technologies are making it possible to use quantitative topography measurements, the field is “facing a likely evolution from qualitative image comparisons to quantitative topography measurements.” Id. at 3.

Currently, there are a number of different methods being developed by various researchers to measure surface topography of casings and bullets. Id. at 4.

Although this emerging technology is evolving, the underlying science is straightforward:

The surface function we want to quantify is simply the degree of similarity of a pair of surfaces. Can one derive a measure of similarity of two surfaces that will lead to identification or exclusion of them as being fired by the same firearm. To accomplish this task, the firearm examiner applies his/her expert judgment in a way that is difficult to quantify. An automated system, by contrast, must be programmed to produce a quantitative measurand for similarity, which the expert can use. Hence, much research in firearms identification is concentrated on finding algorithms and parameters that emphasize the individualized characteristics of surfaces and their similarity to those of other surfaces.

Id. at 8. Examples of topography imaging on a casing and bullet are illustrated below in Figures 1 and 2:

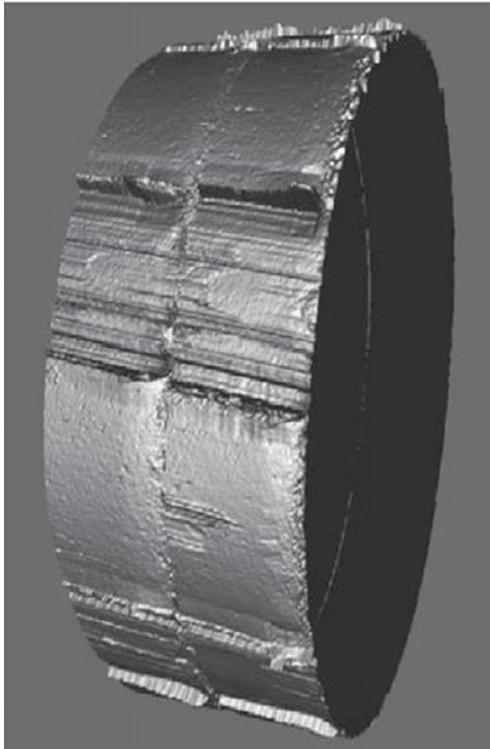


Figure 1. Topography image of 360° bands of two fired 9 mm caliber bullets obtained with disk scanning confocal microscopy. For each image, the system captured and stitched 1.6 mm x 1.6 mm areas while rotating and translating the bullet (courtesy of Ultra Electronics Forensic Technology, Inc. <http://www.ultra-forensictechnology.com/pubs#bro>)

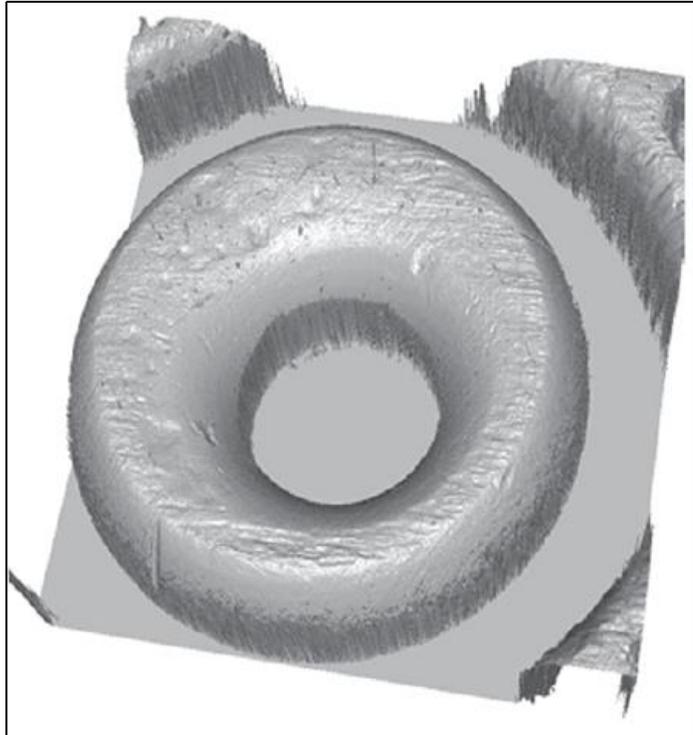


Figure 2. Topography image of the breech face impression of a fired 9 mm cartridge case obtained with disk scanning confocal microscopy (Vorburger T *et al* 2007 *Surface Topography Analysis for a Feasibility Assessment of a National Ballistics Imaging Database, NISTIR 7362* National Institute of Standards and Technology, Gaithersburg MD). The field of view is roughly 4 mm on a side.

The profession is also actively researching ways to tackle the scientific challenge of applying a statistical model to the field of firearms and toolmark identification. Weller Statement at 4. A summary of the profession's research into statistical models, random match probabilities, and a discussion of the subjective nature of firearm and toolmark identification can be found in the

paper by Murdock et al.<sup>9</sup> Although efforts to apply statistical models to firearms and toolmark analysis were explored as early as 1930's,<sup>10</sup> progress was elusive before technological advancements in 3D measurement instrumentation and analysis algorithms to characterize and compare microscopic toolmarks. Id. It is these technologies that have provided a path forward. Id.

The past decade has seen the extensive research into the complex endeavor of providing objective data to quantify what firearms examiners have been doing in their minds for almost a Century. According to Weller, implementation of 3D technology is a two-part problem. First, the instrumentation used to measure and record the microscope toolmarks has to be developed, tested, and validated. Id. Second, software algorithms used to compare the topographies must also be developed, tested and validated. The profession has devoted significant time and resources to make advancements on this front -- the Vorburger article cited supra has over 100 citations. To assist with the development of a workable statistical model for the field, NIST has begun collecting and hosting a national 3D ballistics image database.<sup>11,12</sup> While these technologies are still in the research and development stage, the goal is to design computer-comparison instrumentation that can become operational in casework. Weller Statement at 5.

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<sup>9</sup> Murdock, J et al "The Development and Application of Random Match Probabilities to Firearm and Toolmark Identification" J Forensic Sci, May 2017 62(3) pp 619-625.

<sup>10</sup> Hamby, J., Norris, S., and Petraco, N., "Evaluation of GLOCK 9 mm Firing Pin Aperture Shear Mark Individuality Based on 1,632 Different Pistols by Traditional Pattern Matching and IBIS Pattern Recognition", Journal of Forensic Science, Volume 61, #1, January 2016, pp. 170-176.

<sup>11</sup> NIST website: <https://www.nist.gov/news-events/news/2016/07/nist-3d-ballistics-research-database-goes-live>, referenced June 27, 2017.

<sup>12</sup> Zheng, A "NIST Reference Ballistics Tool Mark Database for Research and Development of Identification Systems and Confidence Limits" AAFS Annual Seminar, 2015. Abstract available online at: <https://www.aafs.org/wp-content/uploads/2015Proceedings.pdf>.

The research using 3D methods and computer algorithms add objective support to the foundation and experiential knowledge of the firearms identification profession. Id. They do not conflict with the current practices in use. To date, none of the 3D research has found evidence contradictory to the foundational principles of firearms identification. Id. With further development, sufficiently accurate computer algorithms may allow for the objective scoring of matching and non-matching firearm toolmark comparisons; which in turn will allow for the development of confidence scores and statistical models. Id. The FBI Firearms/Toolmark Unit has validated and will begin using some 3D technology (virtual microscopy) in comparison casework.<sup>13</sup> While 3D measurement and computer aided analysis remains an area of active research, the FBI's use of virtual microscopy shows the profession is actively engaged in research, development, and adoption of new technology. Id. at 6.<sup>14</sup>

## ARGUMENT

### I. Firearms and Toolmark Analysis Passes the Rule 702 Test

In Daubert, the Supreme Court provided a non-exhaustive list of factors to consider when evaluating the admissibility of expert testimony under Rule 702, including whether a theory or

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<sup>13</sup> Smith, E. Lecture presented during training of 2017 National Firearms Examiner Academy, May 11, 2017, Gaithersburg, MD (NIST Campus). The FBI Firearms and Toolmark unit is implementing the use of virtual microscopy in their casework analysis protocols. In virtual microscopy, the microscope toolmarks are measured and digitally recorded. Comparisons are manually performed by a human examiner on the computer, rather than directly viewing the samples on a comparison microscope. The deployment of 3D technology by the FBI is an important first step in the adoption of this new technology.

<sup>14</sup> The complete validation of 3D systems for forensic firearm and toolmark casework will be a multi-step process. Both the hardware (the 3D measuring device) and the comparison software will need to undergo both a developmental and deployment validation steps. Portions of the developmental work continues to be performed by manufacturers as well as firearms examiners. Once a system is purchased by a laboratory, the individual laboratory will need to perform their own internal validation studies. The FBI has assisted with both developmental research and has validated a portion (the virtual microscopy) of the technology for use in casework. Weller Statement at 6.

technique (1) has been or can be tested; (2) has a known or potential rate of error; (3) has been subjected to peer review and publication; (4) has standards controlling the techniques operation; and (5) enjoys acceptance within the relevant scientific community. Daubert, 509 U.S. at 593-94. Moreover, contrary to defendant's position, Rule 702 embodies a more liberal standard of admissibility for expert opinions than did Frye. United States v. Williams, 506 F.3d 151, 161-62 (2d Cir. 2007). Although Daubert was limited to scientific evidence, the Supreme Court subsequently clarified that the gatekeeping function of courts described in Daubert applies, not just to scientific testimony, but to all expert testimony. Kumho Tire Co. v. Carmichael, 526 U.S. 137, 141 (1999). In exercising its gatekeeping function, courts must keep in mind the Supreme Court's admonition that "vigorous cross-examination, presentation of contrary evidence, and careful instruction on the burden of proof are the traditional and appropriate means of attacking shaky but admissible evidence." Daubert, 509 U.S. at 596.

As discussed in the attached sworn statement of Todd Weller and the numerous peer-reviewed studies cited therein, firearms and toolmark identification satisfies each of the factors enumerated in Daubert. Given the extensive testing, peer-review, low levels of error, and general acceptance throughout the world, every court to address the admissibility of firearms evidence under this standard has ruled in favor of admitting firearms evidence. State v. Romero, 341 P.3d 493, 498 (Ariz. App. Div. 2 2014) ("Several federal district courts have held that firearms identification testimony is sufficiently reliable under Daubert and Federal Rule 702"); United States v. Hicks, 389 F.3d 514, 526 (5<sup>th</sup> Cir. 2004) (noting that defendant was unable to point the court to a single case in any circuit showing that the methodology was unreliable); United States v. Santiago, 199 F. Supp.2d 101, 111 (S.D.N.Y. 2002) ("The Court has not found a single case ... that would suggest that the entire field of ballistics identification is unreliable."). Changing from

Frye to Daubert has had no impact on the admissibility of firearms and toolmark identification evidence. See id. (After abandoning Frye, the court found “that the methodology governing firearms identification is sufficiently reliable, under Daubert and ... Rule 702, to permit a qualified expert to provide in-court technical testimony.”).<sup>15</sup> Many federal courts have held extensive hearings before admitting firearms and toolmark identification evidence. United States v. Montiero, 407 F. Supp.2d 351, 355 (D.Mass. 2006) (six-day hearing); United States v. Diaz, 2007 WL 485967, \* 1 (N.D. Cal. Feb. 12, 2007) (four-day hearing); United States v. Taylor, 663 F. Supp.2d 1170, 1171 (D.N.M. 2009) (two-day hearing); United States v. Otero, 849 F. Supp.2d 425, 429 (D.N.J. 2012) (three-day hearing). Moreover, the three reports cited by defendant have enhanced, not undermined, the scientific reliability and admissibility of firearms evidence because each of them have inspired leaders within the firearms community to expand peer-review validation and strengthen the scientific underpinnings of the discipline.

#### **a. Testing the Science of Firearms Identification**

The basic theory of Firearms and toolmark identification -- namely that firearms can impart microscopic toolmarks on fired ammunition components, and that those toolmarks can be used to

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<sup>15</sup> Courts addressing the adoption of Rule 702 in the context of other pattern matching disciplines have reached the same conclusion:

We agree that in most cases, absent novel challenges, fingerprint evidence is sufficiently reliable to satisfy Rule 702 and Daubert. Fingerprint identification has been admissible as reliable evidence in criminal trials in this country since at least 1911. In terms of specific Daubert factors, the reliability of the technique has been tested in the adversarial system for over a century and has been routinely subjected to peer review. Moreover, as a number of courts have noted, the error rate is low. The district court did not err in dispensing with a Daubert hearing.

United States v. John, 597 F.3d 263, 274-75 (5<sup>th</sup> Cir. 2010).

identify a case or bullet to a particular firearm -- was first documented over 100 years ago. Weller Statement at 1.<sup>16</sup> Since the that time, the profession has been engaged in observation, documentation, and testing of firearms identification related topics. Id. Early literature in Firearm Identification is often found in textbook format. Id. at 2.<sup>17,18,19,20</sup> As discussed in the attached sworn statement by Todd Weller, these texts books documented the techniques, instrumentation, and protocols used in the forensic science discipline of firearms identification. Id. In addition, much of the research has been published in peer-reviewed journal articles. An early example of this is the firearms identification research published by Biasotti in 1959. Id.<sup>21</sup>

With the formation of AFTE in 1969 and the start of the AFTE Journal in 1972, more studies were subjected to peer-review before publication. Id. In addition to the AFTE Journal, research articles are published in other peer-reviewed science journals such as the Journal of Forensic Science, Forensic Science International, and Science and Justice. Id. The number of

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<sup>16</sup> Hamby J “The History of Firearm and Toolmark Identification” AFTE Journal 1999 Volume 31, Number 3 (Summer), pp. 266-284.

<sup>17</sup> Gunther, JD, Gunther CO The Identification of Firearms John Wiley & Sons, Inc., New York, New York 1935.

<sup>18</sup> Hatcher JS, Jury FJ, Weller J, Firearms Investigation, Identification and Evidence The Stackpole Company, Harrisburg, Pennsylvania, 1957.

<sup>19</sup> Davis J, An Introduction to Tool Marks, Firearms and the Striagraph, Charles C Thomas-Publisher, Springfield Illinois, 1958.

<sup>20</sup> Matthews J, Firearms Identification Volumes I&II Charles C Thomas-Publisher, Springfield, Illinois, 1962.

<sup>21</sup> Biasotti studied bullets fired through Smith and Wesson revolvers. The author performed statistical analysis after comparing striae between matching and non-matching comparisons. He performed a total of 600 land and 600 groove impression comparisons and used statistical analysis to characterize differences between bullets fired from the same gun versus bullets fired from different guns. Biasotti, A. A., "A Statistical Study of the Individual Characteristics of Fired Bullets", Journal of Forensic Sciences, Vol. 4(1), January 1959, pp. 34-50.

peer-reviewed studies testing the principles of firearms and toolmark analysis are voluminous. Id. A 2007 review by Ronald Nichols highlights some of the past research.<sup>22</sup> Nichols' review illustrates how the profession has studied, characterized, and shared their findings. It is through this type of research and publication that firearms examiners have been able to understand and disseminate the foundational knowledge for the discipline. Weller Statement at 2. A second summary of foundation peer reviewed articles is hosted and maintained on the AFTE website.<sup>23</sup>

Mr. Weller discusses the various forms of testing that has provided objective data to support the fundamental principles of firearms and toolmark identification. Weller Statement at 2-6. These efforts include studies showing the persistence of markings over thousands of firings (allowing examiners to identify first to last cartridge case/bullets fired from a firearm)<sup>24,25</sup> and studies of subclass characteristics to learn what type of manufacturing methods are likely to cause these types of markings and confirm that such characteristics do not interfere with an examiner's ability to distinguish between cartridge cases/bullets fired from two firearms despite the presence

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<sup>22</sup> Nichols, R., "Defending the Scientific Foundations of the Firearms and Tool Mark Identification Discipline: Responding to Recent Challenges", *Journal of Forensic Sciences*, Vol 52(3), May 2007, pp. 586-594.

<sup>23</sup> AFTE Website, <https://afte.org/resources/swggun-ark/testability-of-the-scientific-principle>, accessed July 6, 2017. This list, originally collated and hosted by SWGGUN, is categorized by topics: Firearms Identification-Bullets, Firearms Identification-Cartridge Cases, Firearm and Toolmark Identification-Theoretical, Toolmark Identification, Fracture Matching and Emerging Research.

<sup>24</sup> Gouwe J., Hamby J. E., Norris, S., "Comparison of 10,000 Consecutively Fired Cartridge Cases from a Model 22 Glock .40 S&W Caliber Semiautomatic Pistol", *AFTE Journal*, Volume 40, Number 1, Winter 2008, pp. 57-63.

<sup>25</sup> Saribey, A et al "An Investigation into Whether or Not Class and Individual Characteristics of Five Turkish Manufactured Pistols Change During Extensive Firing", *J Forensic Science*, September 2009, 54(5) pp. 1068-1072.

of subclass characteristics.<sup>26,27,28,29,30,31,32</sup> Thus, the theory has been well tested and favors admissibility. Otero, 849 F. Supp.2d at 433 (“The literature in the field of firearms and toolmark identification documents that the theory has been repeatedly tested.”); Taylor, 663 F. Supp.2d at 1175-76 (noting studies “demonstrating that the methods underlying firearms identification can, at least to some degree, be tested and reproduced.”); Diaz, 2007 WL 485967, at \*6 (holding that “the theory of firearms identification can, though based on examiners’ subjective assessment of individual characteristics, has been and can be tested.”).

Aside from the plethora of research into traditional methods of firearms analysis, Weller discusses the significant efforts over the past decade to conduct peer-reviewed research into topographical three-dimensional imaging, sophisticated computer algorithms, and the application of statistical models to firearms identifications. Weller Statement at 3-6. While this has been a topic of interest to the industry for quite some time, Weller explains that the advancements in computer cost, power, and hard drive capacity has made each of these fields realistic for practical

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<sup>26</sup> Churchman, J.A. “The Reproduction of Characteristics in Signatures of Cooley Rifles”, 1949, RMCP Gazette.

<sup>27</sup> Skolrood, R.W. “Comparison of Bullets Fired From Consecutively Rifled Cooley .22 Calibre Barrels”, 1975, Can.Soc.Forensc.Sci Vol 8(2) pp 49-52.

<sup>28</sup> Coody, A. C., "Consecutively Manufactured Ruger P-89 Slides", AFTE Journal, Volume 35, Number 2, Spring 2003, pp. 157-160.

<sup>29</sup> Matty, W., "Raven .25 Automatic Pistol Breech Face Tool Marks", AFTE Journal, Vol. 16 (3), 1984, pp. 57-60.

<sup>30</sup> Biasotti, A. A. “Rifling Methods-A Review and Assessment of the Individual Characteristics Produced,” AFTE Journal, Vol 13(3) 1981, pp34-61.

<sup>31</sup> Rivera, G. “Subclass Characteristics in Smith and Wesson SW40VE Sigma Pistols,” AFTE Journal Summer 2007, Vol 39(3) pp253-258.

<sup>32</sup> Lightstone, L. “The Potential for and Persistence of Subclass Characteristics on the Breech Faces of SW40VE Smith and Wesson Sigma Pistols,” AFTE Journal Fall 2010 Vol 42(4) pp 308-322.

study. Id. at 4.<sup>33</sup> “The research using 3D methods and computer algorithms add objective support to the foundation and experiential knowledge of the firearms identification profession.” Id. at 6. Importantly, “[t]o date, none of the 3D research has found evidence contradictory to the foundational principles of firearms identification” and with further development “sufficiently accurate computer algorithms may allow for the objective scoring of matching and non-matching firearm toolmark comparisons” which in turn “will allow for the development of confidence scores and statistical models.” Id. As research continues, labs have even begun to adopt aspects of these emerging objective tools into casework. Id. These developments are critical because as discussed below, courts have routinely found that the AFTE Theory of Identification has been tested and have admitted such evidence under Daubert based on the traditional research despite its *subjective* nature. Recent efforts by the field to test the discipline with objective data and lay the foundation for statistical calculations further exemplifies the field’s commitment to addressing the primary criticism of the 2009 NAS Report and PCAST report, namely that the AFTE Theory of Identification is subjective in nature. This monumental effort to lay objective scientific groundwork for casework analysis reveals that the subjective nature of firearm and toolmark analysis (the crux of all criticism cited by defendant) will become obsolete and that none of the many peer reviewed studies to date refute examiners’ ability to conduct firearms and toolmark analysis with a high level of precision.<sup>34</sup>

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<sup>33</sup> It is these very factors that allowed leaders in the field of DNA, such as John Buckleton to develop probabilistic genotyping software.

<sup>34</sup> Much of the testing of traditional firearms analysis is being retested using these new objective tools. For example, the Lightstone samples cited supra were further characterized using 3D measurement analysis algorithm and likelihood ratios. Riva, F “Objective Evaluation of Subclass Characteristics on Breech Face Marks” J Forensic Sci, March 2017, 62(2) 418-422.

**b. Known or Potential Error Rate**

While it is important to show firearms can leave marks that are suitable for identification purposes, the firearms and toolmark identification profession also realized it was important to study if examiners can accurately use those marks for identification. Weller Statement at 6. The firearms and toolmark profession has been proactive about testing examiner performance with a variety of test designs and samples. Id. These studies are often called “validation” studies or “black box” studies and consist of examiners being given a series of samples where there is ground truth known to the researchers. Id. The examiners will then perform comparisons and report their findings, and the test provider will report on the examiners’ performance, i.e., an error rate. Id.

A critical aspect of firearms validation research is the use of consecutively manufactured samples. Consecutively manufactured means these are samples that have been produced one directly after the other, on the same production line, using the same tools. Id. This is important because these are samples that are most likely to have subclass characteristics (or toolmarks with little change or variation from one machined part to the next) and thus have the greatest likelihood of producing a false identification. Id.<sup>35</sup> Despite these *worst-case scenario* samples, peer-reviewed research consistently has shown a low error rate. Id. In other words, trained firearms examiners have consistently demonstrated that they can take cartridge cases/bullets fired from consecutively manufactured firearms and correctly associate each cartridge case/bullet with the correct firearm despite the fact that each of the firearms used in the study came off the assembly line next to one

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<sup>35</sup> Such “worst case scenario” testing is nothing new. See Teale, Popular Science Monthly, February 1932 (author reports on studies by Calvin Goddard in which the examiner was able to identify fired cartridge cases and bullets to consecutively manufactured firearms).

another.<sup>36</sup> Although the import of these worst-case-scenario validation studies were lost on the authors of the 2009 NAS Report and PCAST Report, courts have appreciated the significance of the studies on reliability under Rule 702. Otero, 849 F. Supp.2d at 432 (“Some of these ‘validation studies’ seek to validate the theory that one can individualize tools, even when comparing marks made by tools of the greatest possible similarity, such as those involved in the consecutive manufacture of various firearms of the same make.”) citing Coody, Consecutively Manufactured Ruger P-89 Slides, *ATFE Journal*, Vol. 35, No. 2, Spring 2003 at 157; Brundage, The identification of Consecutively Rifled Gun Barrels, *AFTE Journal*, Vol. 30, No. 3, Summer 1998, at 438.

The following is a non-comprehensive listing of studies and accompanying rate of false positives:<sup>37</sup>

STUDY	ERROR RATE
Brundage (1998)	0% <sup>38</sup>
Bunch & Murphy (2003)	0%
De France (2003)	0% <sup>39</sup>

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<sup>36</sup> PCAST’s disregard for these studies as meaningless underscores the scientific flaws in the report. While the PCAST authors analogize these studies to Sudoku puzzle on the (false) premise that they consist of a closed set, none of the PCAST authors have participated in one of these studies – an endeavor that would highlight the flaws in their analysis. Contrary to the belief of the PCAST authors, many of the consecutive studies do not involve simply matching a set number of fired cases/bullets to a set number of barrels.

<sup>37</sup> Citations are supplied for the studies discussed in Weller’s attached statement.

<sup>38</sup> Brundage, D.J. “The identification of consecutively rifled gun barrels.” *AFTE Journal*, Vol. 30, No. 3 (1998): pp. 438-44.

<sup>39</sup> DeFrance and Van Arsdale. “Validation study of electrochemical rifling.” *AFTE Journal*, Vol. 35, No. 1 (2003): pp.35-7.

Smith (2005)	0% <sup>40</sup>
Orench (2005)	0%
Hamby (2009)	0% <sup>41</sup>
Lyons (2009)	0%
Hamby/Thorpe (2009)	0%
Fadul (2009)	.1%
Petraco (2012)	approx. 1%
Maryland (2012)	1.6% <sup>42</sup>
Fadul (2013)	0.064% Phase 1 .18% Phase 2 <sup>43</sup>
Fadul (2013)	.7% <sup>44</sup>

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<sup>40</sup> Smith, E. “Cartridge case and bullet comparison validation study with firearms submitted in casework.” AFTE Journal, Vol. 37, No. 2 (2005): pp. 130-5.

<sup>41</sup> Hamby, J.E., Brundage, D.J., and J.W. Thorpe. “The identification of bullets fired from 10 consecutively rifled 9mm Ruger pistol barrels: a research project involving 507 participants from 20 countries.” AFTE Journal, Vol. 41, No. 2 (2009): pp. 99-110.

<sup>42</sup> Maryland B, Tucker C “Validation of Obturation Marks in Consecutively Reamed Chambers” AFTE Journal, Vol 44(2) Spring 2012, pp. 167-169. One examiner reported three false identifications, and the remaining 63 examiners reported no false identifications (overall error rate of 1.6%). This illustrates Dr. Budowle’s point infra that error rates are variable.

<sup>43</sup> Fadul, T.G., Hernandez, G.A., Stoiloff, S., and S. Gulati. “An empirical study to improve the scientific foundation of forensic firearm and tool mark identification utilizing 10 consecutively manufactured slides.” AFTE Journal. Vol. 45, No. 4 (2013): pp. 376-93.

<sup>44</sup> Fadul, T.G., Hernandez, G.A., Stoiloff, S., and S. Gulati. “An empirical study to improve the scientific foundation of forensic firearm and tool mark identification utilizing consecutively manufactured Glock EBIS barrels with the same EBIS pattern.” National Institute of Justice Grant #2010-DN-BX-K269, December 2013.

Baldwin (2014)	1.01% <sup>45</sup>
Stroman (2014)	0% <sup>46</sup>
Smith (2016)	0% (Bullets) .144% (Cases) <sup>47</sup>

In Otero, the district court discussed why it is most probative to focus on false positives when considering error rates:

The Court further finds that the error rate for false positives, as reported by the Grzybowski article, is pertinent to its assessment of the expert testimony in this case, as the proffered testimony would make such a positive identification of the guns recovered from Defendants as the origin of the bullet and shells recovered from the crime scene. Indeed, for the purposes of utilizing toolmark identification in legal proceedings, the critical validation analysis has to be the extend to which false positives occur.

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<sup>45</sup> Baldwin, D.P., Bajic, S.J., Morris, M., and D. Zamzow. “A study of false-positive and false-negative error rates in cartridge case comparisons.” Ames Laboratory, USDOE, Technical Report #IS-5207 (2014). Weller makes a point of citing to the following excerpts from this study:

This finding does not mean that 1% of the time each examiner will make a false-positive error. Nor does it mean that 1% of the time laboratories or agencies would report false positives, since this study did not include standard or existing quality assurance procedures, such as peer review or blind reanalysis. What this result does suggest is that quality assurance is extremely important in firearms analysis and that an effective QA system must include the means to identify and correct issues with sufficient monitoring, proficiency testing, and checking in order to find false-positive errors that may be occurring at or below the rates observed in this study.

All but two of the 22 false identification calls were made by five of the 218 examiners, strongly suggesting that this error probability is not consistent across examiners (or in effect, that each examiner has his or her own false identification probability, and that these probabilities vary substantially).

Weller Statement at 8-9.

<sup>46</sup> Stroman, A. “Empirically determined frequency of error in cartridge case examinations using a declared double blind format.” AFTE Journal, Vol. 46, No. 2 (2014):pp. 157-175.

<sup>47</sup> Smith, Smith, Snipes, J.B. “A Validation Study of The Bullet and Cartridge Case Comparisons Using Samples Representative of Actual Casework.” Journal of Forensic Sciences, 2016, Vol. 61, No. 4: pp. 939-946.

849 F. Supp.2d at 433. As discussed, infra, renowned geneticist Dr. Budowle explains the multitude of reasons why it is nearly impossible to calculate a discipline-wide error rate. However, the above-list of validation studies indicates that the firearms discipline continues to conduct studies to research the number of false positive identifications, oftentimes under worst-case-scenario circumstances, and trained examiners continue to demonstrate that the rate or error for the field is quite low. United States v. Ashburn, 88 F.Supp.3d 239, 246 (E.D.N.Y. 2015) (“The court finds that due to the subjective nature of the inquiry, a definitive error rate is impossible to calculate, but also finds that the error rate, to the extent it can be measured, appears to be low, weighing in favor of admission of the expert testimony.”); Otero, 849 F. Supp.2d at 434 (“information derived from [] proficiency testing is indicative of a low error rate,”); Taylor, 663 F. Supp.2d at 1177 (concluding that the error rate is “quite low,”); Diaz, 2007 WL 485967, \*8 (concluding that due to the subjective nature of the methodology, “it is not possible to calculate an absolute error rate for firearms identification,” but that “the government has provided enough data to show that the error rates among trained firearms examiners are sufficiently low to counsel in favor of admitting the evidence,”).

Finally, the accuracy of individual casework is enhanced through technical review of case notes and through standard operating procedures which typically require all identifications to be documented and then subjected to confirmation by a second examiner. Because firearms evidence is non-consumptive by nature, the internal laboratory quality assurance programs are further

enhanced by the fact that the defense has the opportunity for additional review through independent testing if there is any reason to suspect that an error has occurred.<sup>48</sup>

In the case at hand, there is no indication of error. The firearms examiner has not failed any of his proficiency exams, his conclusions were peer-reviewed by another trained firearms examiner before the report was issued, and the defense has not elected to have an expert re-examine the evidence, much less proffer an expert opinion contrary to the opinion reached by the government's expert here.

### **c. Peer-Review**

Studies testing the foundational research of firearms and toolmark identification and examiners' ability to reliably match a cartridge case/bullet to a particular firearm have been published in peer-reviewed scientific journals, including the AFTE Journal,<sup>49</sup> the Journal of Forensic Science, Science and Justice, and Forensic Science International. Weller Statement at 10. In fact, nearly all the citations in Weller's statement (re-cited herein) are from peer-reviewed scientific journals.<sup>50</sup> Moreover, the field's research into objective means to quantify and validate firearms and toolmark identifications through the use of 3D topographical imaging, sophisticated

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<sup>48</sup> Another measure of profession error can be gleaned from examining proficiency test records. See Murphy, D., "CTS Error Rates, 1992-2005 Firearms/Toolmarks", Presented at the 41st Association of Firearm and Tool Mark Examiners (AFTE) Training Seminar, Henderson, NV, May 5, 2010. In this case, Firearms Examiner Spinder has passed all of his proficiency exams with no errors.

<sup>49</sup> The AFTE Journal and peer-review process is discussed in Denio, Dominic J., The History of the AFTE Journal, the Peer Review Process and Daubert Issues, AFTE Journal Spring 2002, pp. 210-214.

<sup>50</sup> Weller himself has served as peer reviewer for both the Journal of Forensic Science and AFTE Journal. Although the process differs, the result is the same: articles are reviewed by subject matter experts who judge the paper on its scientific merit. Weller has accepted, revised, and rejected papers for both journals. Weller Statement at 9-10.

computer algorithms, and the implementation of statistical tools through the establishment of firearms databases is conducted in peer-review scientific journals as well. Thus, the field has subjected itself to significant scientific peer-review. Ashburn, 88 F.Supp.3d at 246 (“The court finds that the AFTE methodology has been published and subject to peer review, weighing in favor of admission ....”); Diaz, 2007 WL 485967, at \*8 (“The fact that the articles submitted to the AFTE Journal are subject to peer review weighs strongly in favor of admission.”); Otero, 849 F. Supp.2d at 433 (noting AFTE Journal’s formal process for the submission of articles); Taylor, 633 F. Supp.2d at 1176 (finding the peer review factor “clearly weighs in favor of admissibility.”).

As noted above, in addition to peer-review in scientific journals, casework laboratories also conduct internal peer-review with casework through a technical review and verification – a quality assurance step that Dr. Budowle characterizes as a critical part of a holistic approach to the evaluation of a forensic science. Budowle Statement at 9. Moreover, the defense may also elect to have its own expert conduct peer-review of the conclusions proffered by the prosecution’s expert – an additional layer of peer-review advocated by the NRC II and by many leaders within the scientific community such as Dr. Budowle.<sup>51</sup> John, 597 F.3d at 276 ([Appellant] had the opportunity to analyze the fingerprint evidence herself and question its validity.”). To date, the defense has not even requested to have an expert independently examine the firearms evidence, much less proffer a contrary opinion by a qualified firearms expert.

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<sup>51</sup> Like the NRC I, PCAST completely overlooks this type of internal and external peer-review in casework as a critical quality assurance check.

#### **d. Maintenance of Standards and Controls**

Standards and Controls for the firearms and toolmark profession are published and maintained from several sources. As discussed by Weller, AFTE has published the following standards for professional guidance and use:

- AFTE Training manual: 166-page document outlining all steps a new trainee should undertake prior to starting casework.
- AFTE Technical Procedures Manual: 116-page document providing technical procedures for typical examinations that may occur in firearms and toolmark identification laboratories.
- AFTE Glossary: 244-page document providing the profession with standardized terminology and definitions.<sup>52</sup>
- AFTE Theory of Identification<sup>53</sup>: First published in 1992, the Theory of Identification distills the essence of firearms identification into several paragraphs. The Theory of Identification describes the basis for an identification as well as the current limitations of profession. The theory has undergone revisions and remains the agreed upon standard for identification by the firearm and toolmark profession.

Weller Statement at 10. Another source of standardized guidelines for the profession were established by the Scientific Working Group for Firearms and Toolmarks (SWGUN). Id. SWGGUN was a committee of firearms examiners whose responsibility was to publish guidelines for the firearm and toolmark community.<sup>54</sup> The SWGGUN has been replaced by the Organization of Scientific Area Committees (OSAC) for which Todd Weller currently serves as the Vice Chair.

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<sup>52</sup> The AFTE Training Manual, Technical Procedures Manual and Glossary, as noted, are each over a hundred pages long, and thus too large documents to attach to this pleading. They are available to AFTE members for download from the AFTE website: [www.AFTE.org](http://www.AFTE.org).

<sup>53</sup> Committee for the Advancement of the Science of Firearm & Toolmark Identification “Theory of Identification as it Relates to Toolmarks: Revised,” AFTE Journal Fall 2011, Vol 43(4) pp. 287.

<sup>54</sup> The SWGGUN guidelines can currently be found on the OSAC website: <https://www.nist.gov/topics/forensic-science/firearms-and-toolmarks-subcommittee>.

According to Weller, the OSAC is in the process of revising and writing standards that are discipline specific, so the field continues to move forward on this front as well. Id. at 10.<sup>55</sup> Accordingly, the field maintains, and continues to develop, standards controlling the technique's operation. Ortero, 849 F. Supp.2d at 435 (“In sum, the Court concludes that the maintenance of industry-compliant standards by the [New Jersey State Police] for conducting a firearms and toolmark identification examination, and the adherence to those standards and procedures by [the examiner], further support the reliability and therefore admissibility of the expert testimony.”).

This is the only Daubert factor that some courts have found lacking, even though all of them have gone on to admit firearms and toolmark identification testimony. Montiero, 407 F. Supp.2d at 371-72 (“[O]ne critical problem with the AFTE Theory is the lack of objective standards.”); United States v. Green, 405 F. Supp.2d 104, 114 (D.Mass 2005); United States v. Glynn, 578 F. Supp.2d 567, 572 (S.D.N.Y. 2008) (“[T]he standard defining when an examiner should declare a match – namely ‘sufficient agreement’ – is inherently vague.”). Notably, the limitation noted by these courts has become largely outdated by the extensive research the field has devoted to objectively quantifying the markings associated with an identification through 3D imaging and sophisticated computer algorithms combined with the establishment of ballistic databases for the eventual implementation of statistical calculations in casework. Importantly, nothing in the hundreds of peer-reviewed journal articles to date has invalidated the foundational premise that a trained examiner can reliably identify a cartridge case/bullet to a particular gun.

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<sup>55</sup> ANAB (ANSI-ASQ National Accreditation Board) has merged with ASCLD-LAB and is the current predominate forensic laboratory accrediting body. ANAB uses the 17025 ISO standard, an international standard developed for accrediting testing and calibration laboratories. ANAB accreditation includes the review and accreditation of firearm & toolmark laboratories. Weller Statement at 10.

Weller Statement at 6. In other words, even though subjectivity remains in the methodology, current research provides objective empirical support for this work.

**e. General Acceptance**

As the Court of Appeals has already held, firearms and toolmark identification evidence “remains widely accepted” within the scientific community. Jones v. United States, 27 A.3d 1130, 1137 (D.C. 2011); Joseph D. Thomas v. United States, Nos. 09-CF-1572, et. al. Memorandum Opinion and Judgment \*\* 3-4 (D.C. App. June 22, 2012) (Attachment X) (“We conclude that there has been no sufficient showing that firearms and toolmark identification is no longer accorded general acceptance and, thus, [appellant] has failed to meet his burden in challenging the admissibility of expert testimony on these matters”).<sup>56</sup> Nothing has altered the wide consensus within the community since Jones. As noted by Weller, the discipline is practiced in crime laboratories throughout the United States as well as internationally. Weller Statement at 10.

In sum, firearms and toolmark identification satisfies admissibility under Rule 702, and no court has held otherwise.

**II. The 2008 Ballistic Imaging Report**

Defendant cites selected excerpts from the voluminous 2008 Ballistic Imaging Report to support the exclusion of firearms and toolmark identification evidence. Defendant’s Motion at 14-15. PDS’s initial effort to exclude firearms evidence in 2008, when it filed a series of motions to exclude firearms evidence based on this report, was unfounded, and their comparable argument

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<sup>56</sup> In reviewing the admissibility of handwriting analysis under Frye, the D.C. Court of Appeals cited Jones for the proposition that “pattern matching is not new, and courts in this jurisdiction have long been admitting firearms identifications based on this method.” Pettus v. United States, 37 A.3d 213, 217 (D.C. 2012).

under Rule 702 is comparably unfounded. Defendant cites no case law in support of this argument because none exists. The few courts that addressed the 2008 Ballistic Imaging Report's impact on the admissibility of firearms evidence dismissed such claims without a hearing.

Defendant ignores the affidavit by John E. Rolph, Chair of the 2008 Ballistic Imaging Report provided in support of the government's opposition to PDS's efforts to suppress firearms evidence in U.S. v. Kevin Edwards, Case No. F-516-01. See May 23, 2008 Affidavit of John E. Rolph (Attachment IX). As indicated by the attached sworn affidavit of Dr. Rolph, the purpose of the report was to assess the feasibility of creating a ballistics data base. See Rolph Affidavit ¶ 3. As Dr. Rolph points out, the admissibility of ballistics evidence in legal proceedings "was explicitly ruled out of the Committee's charge." Rolph Affidavit ¶ 5. Dr. Rolph further clarifies, "[t]he statement in the Report that the 'validity of the fundamental assumptions of uniqueness and reproducibility of firearm-related toolmarks has not been fully demonstrated' (Report at 3-22) was not made in the context of assessing the admissibility of firearms-related evidence." Id. ¶ 6. The Report explicitly stated that it was not passing judgment on the field of firearms and toolmark identification:

*[T]his study is neither a verdict on the uniqueness of firearm-related toolmarks generally nor an assessment of the validity of firearm's identification as a discipline. Our charge is to focus on 'the uniqueness of ballistic images' – that is, on the uniqueness and reproducibility of the markings (toolmarks) left on cartridge cases and bullets as they are recorded or measured by various technologies.*

Rolph Affidavit ¶ 6 (quoting NRC Report on Ballistic Imaging at 1-5 (emphasis in original Report)). Thus, the NRC report did not evaluate, much less undermine, the fundamental assumptions of firearms and toolmark identification.<sup>57</sup> United States v. Casey, 928 F. Supp.2d

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<sup>57</sup> When the the NRC Committee was formed, "it was decided not to include an active firearms examiner" on the Committee. See 2008 Ballistic Imaging Report, Preface at ix. Instead, the NRC

397, 400 (D.P.R. 2013) (Dr. Rolph’s statements greatly undermine the portions of the 2008 NAS report upon which defendant ... relies.”); State v. Langlois, 2 N.E.3d 936, 945 (Ohio Ct. App. 2013) (“the 2008 NRC report addressed the issue of establishing a nationwide database for the computer imaging of bullets. The report’s primary focus was not firearms identification, comparative ballistics, or tool mark analysis.”); Taylor, 663 F. Supp.2d at 1175-76, 1179-80 (holding firearms evidence admissible after considering, *inter alia*, the 2008 Ballistic Imaging Report); Otero, 849 F.Supp.2d at 430, 438 (same).

### III. 2009 NAS Report

Regarding the 2009 NAS Report, the D.C. Court of Appeals noted: “[a]lthough such evidence is not properly before us, even after considering it, we are still unpersuaded that *pattern matching* is no longer generally accepted.” Jones, 27 A.3d at 1137 n. 7 (emphasis added). Soon after, in Thomas v. United States, the Court of Appeals held:

In challenging the general acceptance of firearms and toolmark identification, [appellant] relies primarily on [the 2009 NAS Report] – a broad-based report, commissioned by Congress, examining a variety of forensic disciplines, not just firearms and toolmark identification. [Appellant] relies on language in the report, which challenges the lack of statistics, “lack of sufficient studies,” and “lack of a precisely defined process” as evidence that firearms and toolmark identification[s] are no longer generally accepted or, in fact, not “science” at all. [Appellant], however, confuses a single scientific report, which reaches no definitive conclusion and which includes no independent examination of the challenged methodology, with general discord in the scientific community. We therefore reject [appellant’s] reliance on the [2009] NAS Report.

Expert testimony of firearms and toolmark examiners has been admissible in this court for decades – in fact, only a decade shy of a century. Beyond the criticisms and suggestions for more research

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Committee used a single retired firearms examiner as a consultant. Id. Thus, the Ballistic Imaging Committee was not equipped to comprehensively evaluate the field of firearms and toolmark identification under Rule 702 or weigh in on the general acceptance of pattern matching within the relevant scientific community.

raised in the [2009] NAS Report, [appellant] has presented nothing showing that the expert testimony of firearms examiners is not “based on a scientifically sound methodology, as determined by members of the relevant scientific community.” Indeed “[n]ot every scientific opinion is either new or original – some are the kind that are offered all the time.” As the Pennsylvania Superior Court ruled in [Commonwealth v. Whitacre, 878 A.2d 96 (Pa. Super. Ct. 2005)] – a case where the admissibility of firearms and toolmark testimony was challenged as lacking general acceptance – “the technique has been in use since the 1930’s, [and] is neither new nor original, but rather is of the sort that is offered all the time.” Id. at 101.

Memorandum Opinion and Judgment \*\* 3-4.<sup>58</sup>

Defendant seems to suggest that the adoption of Rule 702 somehow changes the impact that the 2009 NAS Report has on the admissibility of firearms evidence. However, after issuance of the 2009 NAS Report local and federal courts continued to admit firearms and toolmark evidence under Daubert and Rule 702. Ashburn, 88 F.Supp.3d at 247 (holding that firearms and toolmark identification is a proper subject of expert testimony under Rule 702 and Daubert after considering the 2009 NAS Report); Romero, 341 P.3d at 498 (same); Casey, 928 F. Supp.2d at 400 (ballistics evidence admissible under Rule 702 and Daubert); Langlois, 2 N.E.3d at 950 (firearms and toolmark identification satisfies the test for reliability under Rule 702); Otero, 849 F. Supp.2d at 438 (essential foundations for the admission of expert testimony under Rule 702 established by the government); United States v. Willock, 696 F. Supp.2d 536, 568 (D. Md. 2010); Taylor, 663 F. Supp.2d at 1180 (“The evidence before the Court indicates that when a bullet is

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<sup>58</sup> In reviewing the admissibility of handwriting analysis under the Frye standard, the D.C. Court of Appeals cited Jones for the proposition that “pattern matching is not new, and courts in this jurisdiction have long been admitting firearms identifications based on this method.” Pettus, 37 A.3d at 217. The Court also addressed appellant’s assertion that the 2009 NAS Report “taken *as a whole* amounts to a critique, and repudiation, of the supposed science underlying all forensic analysis based on pattern-matching, except DNA.” Id. at 226. The Court of Appeals noted: “In our view, however, it exaggerates the measured conclusions and recommendations of the [2009 NAS] Report to read them as a rejection of the scientific basis for all pattern-matching analysis, including handwriting identification.” Id. at 227. As in Jones, the Court of Appeals concluded that the 2009 NAS Report did not undermine the scientific consensus supporting identifications. Id. at 228 and n. 31.

fired from a gun, the gun will impart to the bullet a set of markings that is, at least to some degree unique to that gun. The evidence further indicates that an experienced firearms examiner can make observations of those markings, using a method that has been peer-reviewed, that allow him, in some cases, to form an opinion that a particular bullet was or was not fired from a particular gun. The court therefore concludes that the firearms identification testimony is admissible under Rule 702 and Daubert."); State v. Lee, 2017 WL 1494012, \*10 (4th Cir., Apr. 26, 2017) (“[E]ven after publication of the NAS Report, courts have addressed, in detail, the reliability of [firearms and toolmark identification] testimony and ruled it admissible, although to varying degrees of specificity.”); Spears v. Ryan, 2016 WL 6699681, \*5 (D. Ariz., Nov. 15, 2016) (“[T]he NAS Report would have had no effect on the admissibility of the toolmarks evidence in this case.”); Napier v. Commonwealth, 2014 WL 3973113, \*9 (Ky. Ct. App., Aug. 15, 2014) (It was not the purpose of the 2009 NAS Report to opine on the long-established admissibility of toolmark and firearms testimony in criminal prosecutions and there was no error in taking judicial notice of scientific reliability of ballistic analysis under Daubert); United States v. Sebborn, 2012 WL 5989813, at \* 8 (E.D.N.Y 2012) (no need for a Daubert hearing before admitting ballistics evidence); United States v. Cerna, 2010 WL 3448528, at \*5 (N.D. Cal. Sept. 1, 2010) (the NAS report “does not necessitate exclusion of expert [ballistics] testimony.”).<sup>59</sup>

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<sup>59</sup> The same is true for other pattern matching disciplines such as latent fingerprint identification. Simply put, the 2009 NAS Report “does not say that fingerprint evidence is not accepted in the relevant scientific community and does not say, under either Daubert or Frye, that it should be excluded from court.” State v. Dixon, 822 N.W.2d 664, 674 (Minn. 2012) (the district court’s research did not produce, nor did appellant cite, “a single case where a court has relied on the NAS Report to exclude fingerprint evidence.”). See also, State v. Favela, 323 P.3d 716, 718 (Ariz. 2014) (In admitting fingerprint evidence under newly adopted Daubert standard, court observed: “[t]he overwhelming consensus from federal jurisdictions is that, even when considered ‘[i]n terms of specific Daubert factors, the reliability of the technique has been tested in the adversarial system for over a century and has been routinely subjected to peer review,’ and that ‘absent novel challenges, [expert testimony regarding] fingerprint evidence is sufficiently reliable to satisfy Rule 702 and Daubert.”) (Brackets in original, citations omitted); People v. Wilson, 318 P.3d 538, 545 (Col.

The Court of Appeals has also affirmed limitations on how the 2009 NAS Report can be used for purposes of cross-examination in the latent fingerprint context. In Gee v. United States, 54 A.3d 1249 (D.C. 2012), the Court of Appeals affirmed the trial court’s refusal to take notice of the 2009 NAS Report as a learned treatise and its refusal to permit defense counsel to read from the report on cross-examination of the government’s witness rather than elicit the points of contention through a qualified expert. The Court of Appeals listed numerous reasons why it concluded that the Superior Court Judge did not abuse his discretion “in *declining* to take judicial notice of the ‘Friction Ridge Analysis’ discussion in the [2009 NAS] Report as a learned treatise.”

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2013) (“[T]his case clearly falls within the category of ‘ordinary cases where the reliability of [a fingerprint] expert’s methods is properly taken for granted.’”) (citation omitted); United States v. Avitia-Guillen, 680 F.3d 1253, 1260 (10<sup>th</sup> Cir. 2012) (“Fingerprint comparison is a well-established method of identifying persons, and one we have upheld against a Daubert challenge.”); United States v. Council, 777 F. Supp.2d 1006, 1011 (E.D. Va. 2011) (The NAS Report and defense expert did “not outweigh the acceptance friction ridge analysis has gained from numerous forensic experts and law enforcement officials across the country.”); United States v. Stone, 848 F. Supp.2d 714, 718 (E.D. Mich. 2012) (“Wholesale objections to latent fingerprint identification evidence have been uniformly rejected by courts across the country.”); United States v. Gutierrez-Castro, 805 F. Supp.2d 1218 (D.N.M. 2011) (In admitting latent fingerprint evidence under Daubert, court noted that several courts of appeal have found that district courts did not abuse their discretion in admitting the United States’ latent fingerprint identification evidence.); United States v. Aman, 748 F.Supp.2d 531 (E.D. Va. 2010) (Because the ACE-V method is based on sufficiently reliable principles and methods, and because those principles and methods were reliably applied in this case by an expert with sufficient knowledge, skill, training, and experience, the expert testimony passes muster under Rule 702); United States v. Beasley, 2016 WL 502023, at \* 19 (Dist. Ct. Kan., Feb. 8, 2016) (“The Court denies the defendant’s request for a separate, pre-trial Daubert hearing on the subject of fingerprint science.”); United States v. Campbell, 2012 WL 2373037, at \*3 (N.D. Ga., June 22, 2012) (“Accordingly, the Court finds no error in the Magistrate Judge’s recommended denial of Defendant Campbell’s request for a Daubert hearing and finding that defendant’s objection to the fingerprint evidence go to its weight, rather than its admissibility.”); Cerna, 2010 WL 3448528 \*6 (“[T]he ACE-V method specifically has undergone Daubert analysis by a number of courts and has been repeatedly upheld as sufficiently reliable. A pretrial evidentiary hearing to re-plough ground already canvassed time and time again is unnecessary ....”) (citations omitted); United States v. Love, 2011 WL 2173644, \*8 (S.D. Cal., June 1, 2011) (“[N]one of the seven factors discussed by the parties [testing, peer-review, error rates, standards, general acceptance, relationship to established techniques, and non-judicial applications] weighs against the admission of latent fingerprint evidence.”).

Gee, 54 A.3d at 1266 (emphasis added).

#### **IV. The PCAST Report Does Not Undermine the Admissibility of Firearms and Toolmark Identification**

The PCAST Report makes no attempt to evaluate any forensic discipline under Rule 702, which the D.C. Court of Appeals in Motorola, Inc. v. Murray, 147 A.3d 751 (D.C. 2016) (*en banc*). Instead, the PCAST Report takes what Dr. Budowle characterizes as a “myopic,” rather than a scientifically preferable “holistic,” approach that focuses on a single criterion, *i.e.*, black box validation. Even PCAST’s application of its own myopic criterion is scientifically flawed in ignoring vast bodies of scientific foundational research, peer-reviewed publications, and even validation. For these and other reasons discussed in greater detail below, scientific leaders throughout the forensic community have rejected the PCAST Report’s approach and recommendations.

##### **a. The PCAST Report Generally**

Dr. Bruce Budowle is uniquely qualified to comment on the scientific impact of the PCAST report because he: 1) is the most widely published forensic geneticist in the world; 2) has been at the forefront of every major development of forensic DNA methodologies -- the “gold standard” of forensics -- including authoring the Quality Assurance Standards that are followed in the United States and most of the world; 3) is widely cited by the PCAST Report as a noted expert;<sup>60</sup> and 4) is the forensic geneticist who discovered the errors associated with the application of the Combined Probability of Inclusion (CPI) statistical analysis in connection with DNA mixture interpretation at the D.C. Department of Forensic Sciences (DFS) and elsewhere throughout the United States –

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<sup>60</sup> Dr. Budowle is the scientist at the FBI that is mentioned as Dr. Eric Lander’s co-author to bolster Dr. Lander’s credentials in the forensic sciences at footnotes 17 and 20 of the PCAST Report. Dr. Budowle’s work is also cited in footnotes 33, 149, 183, 185, 187, and 209 of the report.

a topic discussed under the DNA section of the PCAST Report. While Dr. Budowle initially “considered writing a critique about the failing of the PCAST Report to assist the community,” he did not believe that such an effort was worthwhile because “the problems with this report were so obvious.” Budowle Statement at 1. However, because defendant relies so heavily on the PCAST Report for scientific support, Dr. Budowle thought it necessary “to address the serious limitations of the PCAST Report and convey that it is an unsound, unsubstantiated, non-peer reviewed document that should not be relied upon for supporting or refuting the state of the forensic sciences.” Id. Dr. Budowle’s concerns are echoed by Dr. John Buckleton, another highly renowned, widely published geneticist and a founding developer of the probabilistic genotyping software (STR-mix) that has been validated by numerous laboratories throughout the United States, including the FBI Laboratory and DFS. See Buckleton Statement generally.

Dr. Budowle’s initial criticism of the PCAST Report concerns the report’s lack of transparency and peer-review. Although the report claims to have reviewed 2000 papers, there is “no indication that the PCAST Committee actually assessed the data in the literature.” Budowle Statement at 3. Dr. Budowle finds the lack of documentation “extremely troubling” given the Committee’s advocacy for validation, documentation, and peer-review publication for the forensic community; something Dr. Budowle characterizes as a “do as I say, not as I do” position. Id. The report contains no discussion on the “criteria that were used to assess the literature” or “the criteria that were used to dismiss the literature as inadequate,” so there is no basis to assess whether PCAST conducted a sound review:

Again, these issues are most disconcerting because it is apparent that the PCAST Committee in its undertaking did not hold itself up to the same standards of validation, documentation, and peer-review that it espouses the forensic community should embrace (compounded as a number of the criticisms in the report are unfounded).

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The report advocates emphatically and repeatedly the virtues of validation, documentation, and peer-review. Yet the report does not contain such information and thus does not meet as a minimum the requirements that it lambasted the forensic science community for lacking.

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The academic and professional standings of the PCAST Committee members are not a substitute for good practices (none of which are documented). No one should take seriously this report because it has little substance to support its contentions.

Budowle Statement at 3 - 5.

Dr. Budowle focuses on how the PCAST Report is scientifically deficient in the area of DNA because that is his area of expertise and because DNA is considered the “gold standard” of forensics. Id. Dr. Budowle explains that all science continues to improve; it is never static. Id. For example, Dr. Budowle is currently working to improve the widely accepted DNA typing methods through the use of next generation sequencing and new software tools. Id. It would be naïve to believe that any method is perfect and cannot be improved upon; however, this should not be interpreted as a wholesale condemnation on any forensic discipline. Id. Each application of each discipline should be evaluated through what Dr. Budowle characterizes as a “holistic system” – not solely based on a narrowly crafted validation criterion “as the report seemingly myopically espouses.” Id.<sup>61</sup>

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<sup>61</sup> Another deficiency in the report that Dr. Budowle characterizes as “egregious” is the “misuse and disregard for statistics.” Id. at 5. For example, the report discusses the fact that DNA testing has led to 342 exonerations – a fact Dr. Budowle characterizes as “statistically meaningless out of context.” Budowle Statement at 6. Yet, the Committee did not perform any statistical analyses or “even appear to collect the data necessary to put these numbers in the proper context.” Id.

PCAST recommends that a subjective feature-comparison method “must be evaluated as if it were a ‘black box.’” Notably, Dr. Budowle and others recommended the black box approach after the review of the FBI laboratory’s latent print misidentification related to the Madrid bombing incident.<sup>62</sup> The PCAST Report “calculated upper bound error rates based on the results of the very few black box studies they discuss.” Budowle Statement at 7. However, Dr. Budowle warns that such a calculation “does not necessarily help address error that may or may not have occurred during a specific case analysis,” and he goes on to delineate the myriad problems associated with such an overly simplistic approach. Id. First, a black box study only tests those in the study; the average rate inflates the performance of the poorer analysts and deflates the performance of the better analysts. Id. Moreover, “the information content and quality of the results from a forensic science analysis vary from sample to sample.” Id. A single black box error rate does not take into account the difficulty of a particular sample in a particular case. Although the PCAST Committee recognized that differences in the quality of DNA evidence affect the difficulty of interpretation, it failed to realize that a single black box error rate cannot be representative of every case sample, something Dr. Budowle characterized as “another obvious inconsistency in the report.” Id.

In addition, Dr. Budowle points out that the PCAST Report is oddly silent on the fact that “the most direct way to measure the truth of the purported results is to have another expert conduct his/her own review, as is advocated by the National Research Council Report II for DNA

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<sup>62</sup> See Smrz, M.A., Burmeister, S.G., Einseln, A., Fisher, C.L., Fram, R., Stacey, R.B., Theisen, C.E., and Budowle, B.: Review of FBI latent print unit processes and recommendations to improve practices and quality. *J. Forens. Ident.* 56(3):402-434, 2006.

analysis.”<sup>63</sup> According to Dr. Budowle, this form of quality assurance is a critical part of a holistic approach that increases validity and reliability in any one case:

Quality assurance provides an infrastructure to promote high performance, address errors that arise, and improve process. In addition to validation studies, there are other mechanisms such as technical review of a case that reduce error. This technical review is performed within the laboratory before issuing a report and also outside the laboratory when an expert witness is acquired by the opposing side to assess results and interpretations. The PCAST Report seems to ignore the value of these additional quality measures and the strength of the adversary system.

Budowle at 8.

Furthermore, error rates are difficult to calculate because they are fluid:

When an error of consequence (i.e., a false “match”) occurs, under a sound quality assurance program corrective action is taken (to include review of cases analyzed by the examiner prior to and post the discovery of the error). When the corrective action is such that the individual will no longer commit that error, it no longer impacts negatively on the individual’s future performance. In fact, he/she is better educated and less likely to err. The calculation of a current error rate then should not include the past error(s).

Id.<sup>64</sup>

PCAST wholly dismisses factors such as “experience” and “judgment” and peer-review in evaluating a forensic discipline. But as Dr. Budowle notes:

Even to a lay person these statements should be obviously

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<sup>63</sup> “A wrongly accused person’s best insurance against the possibility of being falsely incriminated is the opportunity to have the testing repeated. Such an opportunity should be provided whenever possible. As we have previously noted, retesting provides an opportunity to identify and correct errors that might have been made during the course of analysis.” See NRC II Report, *The Evaluation of Forensic DNA Evidence*, 1996, at 87 <https://www.nap.edu/catalog/5141/the-evaluation-of-forensic-dna-evidence>. The Public Defender Service is well aware of this provision because they cite it in virtually every motion to oppose consumption of evidence by the United States. Of course, this recommendation is always available in the context of firearms analysis because the evidence is non-consumptive in nature.

<sup>64</sup> Events at DFS over the past several months illustrate Dr. Budowle’s point. Quality assurance controls in place at DFS identified two casework errors and rectified the situation by taking the examiner off casework. Thus, the errors are not repeatable and not reflective of an “error rate” within the Firearms Unit at DFS.

inconsistent, troubling and point to the inadequacy of the PCAST Committee addressing the topic of forensic science reliability. I fail to see why the medical and psychology fields can have another expert review another's work (on what may be life and death decisions) and opine on the analysis/interpretations; yet a qualified forensic science analyst cannot perform a technical review of forensic work to assess analysis/interpretations (especially since the report has ignored data that support that at some level forensic testing is reliable). The logic of the PCAST Committee escapes me.

Budowle Statement at 9.

**b. PCAST Missed the Mark on DNA**

The PCAST Report takes the extraordinary position that both the interpretation of complex mixtures with the Combined Probability of Inclusion (CPI) statistic as well as probabilistic genotyping software are not foundationally valid. However, Dr. Bruce Budowle (arguably the most qualified geneticist to opine on the foundational validity of CPI) and Dr. John Buckleton (one of the developers of the probabilistic genotyping software validated by numerous local, state, and federal laboratories) make clear in their attached affidavits that PCAST's evaluation of these aspects of forensic DNA is scientifically flawed.

Dr. Budowle is uniquely qualified to opine on CPI due to his vast, unparalleled knowledge and experience and because he was intimately involved in the evaluation of the use of CPI by the Texas Forensic Science Commission (alluded to in the PCAST Report) as well as being the scientist who discovered the errors in the application of CPI at DFS. Dr. Budowle explains that the issue with CPI was in its application by forensic scientists and not due to the subjective nature of the analysis or a lack of scientific validity. Budowle Statement at 9. Oddly, the PCAST Committee endorsed the use of the Random Match Probability (RMP) statistic; yet, "the principles of the foundational validity of the CPI are the same as those for the random match probability" -- both the CPI and RMP "use the same population frequency data and the same well-established

principles of population genetics and statistics.” Id. at 10. According to Dr. Budowle, “it borders on the bizarre that the PCAST Committee failed to understand the foundations of DNA statistics.” Id. Even after Dr. Budowle and other renowned scientists presented PCAST with a peer-reviewed journal article (along with the many references contained therein) discussing the proper use of the CPI statistical calculation for complex mixture interpretation, the PCAST Committee ignore it. Id.<sup>65</sup> The Committee’s failure to evaluate this type of peer-review publication was troubling to Dr. Budowle because “the CPI is a rather simple concept and its foundations are basic.” Id.<sup>66</sup>

According to Dr. Buckleton, the PCAST Committee fared no better in its evaluation of probabilistic genotyping. As with other disciplines, the Committee made little effort to obtain relevant scientific data, largely ignored what was presented to it, and showed a fundamental lack of understanding in its criticism and recommendations. Buckleton Statement at 1-3.<sup>67</sup>

Dr. Budowle points out that the “failure of the PCAST Committee of not considering all available data is reminiscent of a similar situation that occurred 25 years ago with another report – the National Research Council I” (another report co-chaired by Dr. Eric Lander). Budowle Statement at 11.

The NRC I Report proposed a non-scientific, *ad hoc* way to calculate statistics called the ceiling principle. The ceiling principle had no genetics foundation or validity and was roundly rejected.

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<sup>65</sup> See Bieber, F.R., Buckleton, J., Budowle, B., Butler, J., and Coble, M.D.: Evaluation of forensic DNA mixture evidence: protocol for evaluation, interpretation, and statistical calculations using the combined probability of inclusion. *BMC Genetics* 17(1):125, 2016.

<sup>66</sup> One of the other authors on this peer-reviewed article was Dr. Fred Bieber, a geneticist and statistician at Harvard, who was the other scientist who worked with Dr. Budowle in uncovering the CPI errors at DFS.

<sup>67</sup> For example, the Committee criticized laboratories for not publishing internal validation, but as pointed out by Drs. Budowle and Buckleton, once a new methodology has been published by its developers, it is no longer novel and unlikely to be published each time a laboratory conducts an internal validation. Budowle Statement at 11; Buckleton Statement at 1. However, as pointed out by Dr. Buckleton, these validations are nevertheless part of the peer-review process because they are in the public domain either on individual laboratory websites or on Dr. Buckleton’s webpage. Buckleton Statement at 1.

One of the bases for the proposed ceiling principle approach ... was a lack of population data. There were substantial population data in crime laboratories world-wide at the time the NRC I Report was published; but the NRC I Committee did not seek out the data. As soon as the NRC I Report was published, I reached out to my colleagues around the world and gathered the existing data which were then compiled into a five volume compendium. If the NRC I Committee had chosen to consider extant population data, they might have prepared a more informed Report. The outcome was that the National Academy of Sciences convened a second committee and produced a sound NRC II Report, which was steeped in fundamental population genetics and statistical applications. The findings of the NRC II Report in part were based on the data I compiled in the five volume compendium which were available prior to the publication of the rejected NRC I Report.

Budowle Statement at 11-12. Unfortunately, PCAST has taken the “same blinded approach and ignored extant data with a similar outcome as 25 years ago” with the NRC I. *Id.* at 12.

**c. PCAST Ignored Vast Foundational and Examiner-Testing Validation, and Made Basic Errors in the Small Number of Studies Reviewed in Firearms and Toolmark Identification**

After missing the mark on the gold standard of forensics, PCAST fared no better in evaluating firearms and toolmark analysis. Todd Weller echoes the concerns of geneticists Drs. Budowle and Buckleton in that PCAST ignored the vast amounts of peer-reviewed scientific research and made basic math errors in what little it looked at. The PCAST Report does nothing to undermine admissibility of firearms evidence because it fails to evaluate the field under Rule 702, and its application of its own standard is scientifically deficient.

In 2015, in response for a solicitation for information, the OSAC Firearms Subcommittee, AFTE, and other groups provided PCAST with validation studies pertaining to firearms and

toolmark identification. Weller Statement at 11.<sup>68,69</sup> Inexplicably, the PCAST Committee limited its request for information to the past 5 years of published research. Id. at 11-12.<sup>70</sup> The OSAC firearms subcommittee was concerned about this arbitrary cutoff and hoped its response would prompt a more in-depth, scientifically sound review of the discipline. Id. at 12. PCAST was provided a total of firearms and toolmark identification studies, scientifically peer-reviewed articles, and materials -- some of which are earlier than 2011. Id. at 12.<sup>71</sup> Unfortunately, PCAST's conclusion that firearms and toolmark identification falls short of the criteria for foundational validity "disregarded nearly all of the references provided to them." Id.

Of the 417 articles provide to PCAST, only nine articles were discussed at length in the report. Todd Weller was the primary author of the response submitted by the OSAC firearms and

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<sup>68</sup> OSAC Firearms and Toolmark subcommittee "Response to the President's Council of Advisors on Science and Technology (PCAST)," December 23, 2015. Six questions asked by PCAST can be found in this response. The seventh question was "please share any additional comments".

<sup>69</sup> AFTE "The Association of Firearm and Tool Mark Examiners (AFTE) December 23, 2015 Response to Seven Questions Related to Forensic Science Posed on November 30, 2015 by the President's Council of Advisors on Science and Technology (PCAST)" December 23, 2015.

<sup>70</sup> When the OSAC firearms and toolmarks subcommittee responded to the PCAST request for information, it expressed its concern with this 5-year limitation (emphasis added):

The following are literature citations for studies published in the past five years that provide foundational support to the discipline of firearm and toolmark comparison. Although these citations respond specifically to this Council's focus within the last five (5) years, **it should be noted that a plethora of important literature has been generated outside this time constriction**, which was reported in 2011 to the Research, Development, Testing and Evaluation subcommittee on Forensic Science Interagency Working Group (RDT&E IWG).

Weller Statement at 12.

<sup>71</sup> PCAST "Report to the President Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods" September 2016, References. The PCAST committee listed, in an attachment to their 2016 report, the references provided. Firearms references are numbers 1201 to 1617.

toolmark subcommittee. Weller Statement at 13.<sup>72</sup> The OSAC pointed out that PCAST had made errors or omitted data from their analysis of the firearms validation studies in 4 of the 9 articles discussed in the report. Id. In addition to the sloppy nature of the limited research that was reviewed, Weller discusses why the OSAC concluded that PCAST had missed the mark on firearms and toolmark analysis:

OSAC concluded that PCAST's preferred study design was too narrow, and other types of studies have value in assessing overall error. For example, PCAST failed to recognize that many of the validation studies used consecutively manufactured firearms. By doing so, the firearms and toolmark profession were attempting to create error-rate tests with worst-case scenario samples. Despite these challenging samples, test takers reported few false identifications. Additionally, PCAST preferred the Baldwin et al. study test design where examiners only compared and reported on one questioned item at a time. While this test design has utility (it allows for precise and easy error rate calculations), it does not mimic casework where examiners are tasked with inter-comparing numerous items all at once. It was OSAC's view that when taken as a whole, each validation study provides independent data points that show a low overall error rate.

Weller Statement at 13. When the OSAC sent its response to PCAST, it was hoped that PCAST would recognize the flaw in its narrowly crafted criteria and consider all the research that had been overlooked. Id. In other words, the OSAC advocated for the type of holistic approach discussed supra by Dr. Budowle rather than the narrow approach of focusing only one form of validation. Id.

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<sup>72</sup> OSAC Firearms and Toolmark subcommittee "Response to the President's Council of Advisors on Sciences and Technology (PCAST) Call For Additional References Regarding its report "Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods," December 14, 2016.

Disappointingly, PCAST continued to ignore the vast majority of the research it had been provided. Id.<sup>73</sup> Moreover, PCAST did not even take the time to correct basic mathematical errors contained in the very few studies it reviewed. Id. Given these flaws, it is hard to imagine that PCAST would have survived the very peer-review it advocates. The firearms section of the PCAST Report suffers from the same flaws, namely the report overlooks much of the validation research, and what little research was discussed was riddled with errors.

As with the 2008 Ballistic Imaging Report and the 2009 NAS Report, courts have continued to admit firearms evidence in the wake of the PCAST Report:

In short, the PCAST report does not undermine the general reliability of firearm toolmark analysis or require exclusion of the proffered opinions in this case. Questions about the strength of the inferences to be drawn from the analysis of the examiners presented by the government may be addressed on cross-examination.

United States v. Gregory Chester, et. al., No 13 CR 00774 \*2 (N. Dist. Ill., Oct. 7, 2016) (Attachment XI); Commonwealth v. Hernandez, SUCR2014-10417 \* 5 (Superior Court Mass., Dec. 21, 2016) (Denying defendant's motion to preclude firearms and toolmark identification evidence based on PCAST) (Attachment XII); Commonwealth v. Legore, SUCR 2015-10363 \* 2

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<sup>73</sup> The OSAC firearms subcommittee 2016 report is summarized in the conclusion: "The Firearms and Toolmarks Subcommittee of OSAC fundamentally disagrees with the conclusions regarding the firearm and toolmark identification discipline presented in the PCAST report. Four major points have been put forth in this response. First, we disagree with the premise that a structured black-box study is the only useful way to gain insight into both the foundations of firearm and toolmark identification and examiner error rates. Taken collectively, the published studies support the underlying principles of firearm and toolmark examination and the fact that examiner error rates are quite low. PCAST's critique of these studies included several misunderstandings. Second, PCAST's dismissal of methods employing a subjective component discounts the core scientific methods that have been used for hundreds of years. Third, PCAST misunderstands and misquotes the AFTE Theory of Identification. PCAST's summary of the AFTE Theory of Identification leaves out important provisions. Fourth, PCAST minimizes the value of training and experience. The training received by firearm examiners includes both subjective and objective components and is comparable to the domain-specific rigor of other applied scientific fields." Weller Statement at 13.

(Superior Court Mass., Nov. 17, 2016) (“After a non-evidentiary hearing and argument, and upon review of the PCAST report (and in particular, pages 104-114), there is no basis to disturb settled law permitting a properly qualified firearms expert from offering opinion evidence under [Daubert/Lanigan] relating to a comparison and match between a bullet recovered from the alleged victim, and a bullet test-fired from a firearm allegedly associated with the defendant.”) (Attachment XIII).<sup>74</sup> Courts have similarly continued to admit other forms of forensics criticized by PCAST such as complex DNA mixture analysis despite PCAST’s assertion that such analysis does not enjoy foundational validity. State of Minnesota v. Yellow, File No. 69DU-CR-15-1363, at \*4 (6<sup>th</sup> Jud. Dist., Minn., Oct. 28, 2016) (“The Court found that the opinions met the standard for foundational reliability, and nothing in PCAST Report changes that finding.”) (Attachment XIV); Phillips v. Maryland, 152 A.3d 712, 728 (Md. 2017) (Unnecessary for trial court to hold Frye hearing before admitting evidence of complex mixture interpretation).<sup>75</sup>

#### **V. The Government’s Proposed Testimony Tracks Recommendations by Leaders in the Scientific Community and is Reasonable Given Underlying Validation Support**

The Court should permit the government’s firearms examiner to testify consistently with the current FBI issued Approved Standards for Scientific Testimony and Report Language for the Firearms/Toolmarks Discipline (ASSTR) because this tracks the current thinking in the scientific community, strikes the proper balance in communicating an identification without exaggerating the probative nature, and is grounded in nearly a century of scientific validation.

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<sup>74</sup> Even one outlier court that viewed both the 2009 NAS Report and PCAST as sweeping condemnations of the current state of firearms and toolmark analysis declined to preclude firearms evidence under Frye. State of Missouri v. Goodwin-Bey, Case No. 1531-CR00555-01 (Cir. Ct. Green County, Mo., Dec. 16, 2016) (Attachment XV).

<sup>75</sup> Although the court did not focus on PCAST, it cited the report early in the opinion when referencing complex DNA mixtures. Phillips, 152 A.3d 728 n.3.

In Gardner, 140 A.3d at 1184, the Court of Appeals held that “in this jurisdiction a firearms and toolmark expert may not give an unqualified opinion, or testify with absolute or 100% certainty, that based on ballistics pattern comparison matching a fatal shot was fired from one firearm, to the exclusion of all other firearms.” The Court further explained that its holding “allows toolmark experts to offer an opinion that a bullet or shell casing was fired by a particular firearm, but it does not permit them to do so with absolute or 100% certainty.” Id. at 1184 n.19. Citing Williams v. United States, 130 A.3d 343, 353 n.8 (D.C. 2016) (J. Easterly, concurring), the Court further expressed “doubts as to whether trial judges in this jurisdiction should permit toolmark experts to state their opinions ‘with a reasonable degree of certainty.’” Id. In Jones, Williams, and Gardner, the Court made clear that it was the policy of the U.S. Attorney’s Office not to elicit identification of absolute (100%) certainty to the exclusion of all other firearms. Jones, 27 A.3d at 1139; Williams, 130 A.3d at 348; Gardner, 140 A.3d at 1182-3. Moreover, the Attorney General’s directive about not couching conclusions in terms of “scientific certainty” resolves any doubts about whether the government’s current policy is in line with the Court’s holding in Gardner.

In accordance with the FBI ASSTR, the firearms examiner will state that his examination under the comparison microscope resulted in an *identification* because in his opinion the comparison of the microscopic marks were in sufficient agreement to conclude they originated from the same individual source. The examiner will further explain that, based on his application of the AFTE Theory of Identification and his training and experience, the microscopic marks exceeds the best agreement demonstrated between toolmarks known to have been produced by different tools and consistent with agreement demonstrated by toolmarks known to have been produced by the same tool. As noted above, the field has not completed the research necessary to

implement statistical models to accompany firearms and toolmark identifications – though all research to date confirms assertions by the firearms community for a century that the chance of a coincidental match is infinitesimal. So as not to overstate the nature of an identification, the firearms examiner will refrain from expressing his identification in terms of absolute (100%) certainty and will not state or imply that the identification is being made to the exclusion of all other firearms in the world. Furthermore, consistent with the directive of former Attorney General Loretta Lynch, the government will not have the examiner qualify his conclusions “to a reasonable degree of scientific certainty.”

When one considers that firearms examiners have for decades proven their ability to distinguish toolmarks fired by guns manufactured next to one another on the assembly line, the proposed testimony is quite conservative and soundly supported by nearly a century of validation research. Defendant does not offer any evidence to contrary. Instead, he merely advocates blindly following recommendations by PCAST which, as we have illustrated, are scientifically deficient.<sup>76</sup>

Finally, nothing in defendant’s pleading merits this Court expending time and resources on

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<sup>76</sup> Defendant’s efforts to preclude an identification opinion altogether is more draconian than any other opinion issued by a state or federal court. The closest the government could find occurred in Glynn, 578 F. Supp.2d at 574 wherein the court limited the ballistics opinion to a statement that match was “more likely than not.” Even this opinion, which did permit match testimony by the examiner, is extraordinarily more conservative than the plethora of cases addressing this issue. In fact, other judges have been critical of restrictions of this nature. See e.g., United States v. Johnson, Case No. 14-CR-412, 2015 WL 5012949, \*5 (N.D.Cal. Aug. 24, 2015) (“This Court will not require [the firearms expert] to qualify her expert opinion with the rigid disclaimer that the match is ‘more likely than not,’ as such a specific restriction seems arbitrary. However, should [the firearms expert] testify at trial that the items matched with ‘absolute certainty,’ or to some other arbitrary degree of statistical certainty, the Court will take the necessary steps to strike such improper testimony immediately.”); Cerna, No. CR 08-0730 WHA, 2010 WL 3448528 \*5 (N.D.Cal. Sept. 1, 2010) (noting that the standard in Glynn where the expert was only permitted to state that a bullet or casing “more likely than not” came from a particular firearm “is not appropriate as it suggests that the expert is no more than 51% sure that there was a ‘match.’ Likewise, the proposed ‘practical certainty’ standard, as articulated at the hearing, is not preferable to the Diaz ‘reasonable degree of certainty in the ballistics field’ standard”).

a full evidentiary hearing. However, should this Court decide to go forward, the government will provide expert notice and will request such from the defense.

For the foregoing reason, defendant's motion to suppress or unreasonably limit the proposed firearms and toolmark identification testimony should be denied.

Respectively submitted,

CHANNING D. PHILLIPS  
UNITED STATES ATTORNEY

MICHAEL T. AMBROSINO  
ASSISTANT UNITED STATES ATTORNEY

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LAURA BACH/LINSEY MERIKAS  
ASSISTANT UNITED STATES ATTORNEY

CERTIFICATE OF SERVICE

This is to certify that a copy of the foregoing opposition to defendant's motion to exclude firearms and toolmark testimony was served upon Madalyn Harvey, Public Defender Service, 633 Indiana Avenue, N.W., Washington, DC 20004 this 14<sup>th</sup> day of July, 2017.

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Laura Bach  
Assistant United States Attorney