

The defense ended up withdrawing this motion to prevent a substantial delay in the trial - no response prepared.

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SUPREME COURT, BRONX COUNTY, CRIMINAL DIVISION, PART 50

THE PEOPLE OF THE STATE OF NEW YORK

-against-

NOTICE OF
FRYE MOTION

GIOVANNY ELIGIO,

Ind. No. 4097-08

M01

Defendant

PLEASE TAKE NOTICE, that upon the annexed affirmation of V. Marika Meis Esq. and the prior proceedings in this case, the undersigned will move this Supreme Court, Bronx County Criminal Division, on the 29th day of September, 2009, at 9:30, or as soon thereafter as Counsel may be heard for an Order granting the following relief:

1. Precluding the People from offering expert testimony as to firearms and toolmark identification on the ground that such testimony, in general, and in this case, specifically, is no longer generally accepted in the relevant scientific and legal communities as required by Frye v. United States, 293 F. 1013 (D.C. Cir. 1923).

2. Granting such additional relief as the Court deems just and proper.

DATED: Bronx, New York
September 29, 2009



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Clerk of the Supreme Court, Bronx County Criminal Division

SUPREME COURT, BRONX COUNTY, CRIMINAL DIVISION PART 50

THE PEOPLE OF THE STATE OF NEW YORK

-against-

GIOVANNY ELIGIO,

Ind. No. 4097-08

Defendant

**MEMORANDUM OF LAW IN SUPPORT OF MOTION TO PRECLUDE
EXPERT TESTIMONY RELATED TO FIREARMS
AND TOOLMARK IDENTIFICATION**

The Bronx Defenders
860 Courtlandt Avenue
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V. Marika Meis
Attorney for Mr. Eligio

Giovanny Eligio respectfully submits this memorandum of law in support of his motion *in limine* to preclude the People from offering any expert testimony on firearms and toolmark identification¹ as such evidence is no longer generally accepted in the relevant scientific and legal communities as required by the standard established in Frye v. United States, 293 F. 1013 (D.C. Cir. 1923). Alternatively, Mr. Eligio seeks to limit the scope of any expert testimony by precluding conclusions about whether various shell casings and other types of firearm evidence recovered in this case were fired from one gun.

INTRODUCTION

The People in this case plan to offer expert testimony related to firearms and toolmark identification. Specifically, the People seek to offer Detective Luis Fontanez, a law enforcement witness from the New York City Police Laboratory Firearms Analysis Section, to testify that the five 45-caliber automatic shell casings recovered from the crime scene in this case were fired from one gun, and that a piece of a copper jacket and a deformed, lead bullet recovered from the crime scene in this case were fired from one gun. Notably, no firearm itself was recovered. Under Frye, the People have the burden of establishing that the theory of firearms and toolmark identification is generally accepted in the relevant scientific community.

Although admitted by courts for some time, the field of firearms and toolmark identification is no longer generally accepted in the relevant scientific and legal communities, especially in the absence of the recovery of a firearm. As detailed in the attached Affirmation

¹Firearms and ballistics are phrases often used interchangeably, but the term “firearms” relates to the matching of ammunition components to a particular firearm or other ammunition component, while the term “ballistics” refers to the motion of projectiles within a firearm. See Paul C. Giannelli, *Ballistics Evidence: Firearms Identification*, 27 Crim. L. Bull. 195, 197 (1991). For purposes of this memorandum, the term “firearms” or “firearms identification” will be used to refer to the proffered evidence and the NYPD’s methods for reaching its conclusions.

of Professor Schwartz, two recently published National Research Council reports severely criticized the underlying premise and methodology of firearms and toolmark identification and highlighted the significant disagreements within the discipline, calling into question the “scientific reliability of the entire field of firearms and toolmark identification.” See Affirmation of Adina Schwartz (“Schwartz Affirmation”) (attached), Professor in the Department of Law, Police Science and Criminal Justice Administration at John Jay College of Criminal Justice and in the Criminal Justice Ph.D Program of the Graduate Center, City University of New York (CUNY) at ¶ 2 (citing Committee to Assess the Feasibility, Accuracy, and Technical Capability of a National Ballistics Database, *Ballistics Imaging* (2008) (“NRC Ballistics Imaging Report”) and Committee on Identifying the Needs of the Forensic Science Committee, *Strengthening Forensic Science in the United States: A Path Forward* (2009) (“NRC Forensic Science Report”).

This memorandum and supporting Affirmation explain why the underlying theory and current practice of firearms and toolmark identification are not generally accepted in the relevant legal and scientific communities. Recent decisions from federal courts in New York and elsewhere have re-examined the admissibility of firearms and toolmark identification evidence, noted that scholarly developments in the field have credibly undermined the underlying premise and practice of firearms and toolmark identification, and limited such testimony. See, e.g. United States v. Glynn, 578 F.Supp.2d 567, 574 (S.D.N.Y. 2008) (holding Daubert hearing on admissibility limiting expert testimony to firearms examiner’s opining only that a firearms match was “more likely than not”); United States v. Damien Brown et al., 05 CR 538 (S.D.N.Y. June 9, 2008) (Rakoff, J.) (following a Daubert hearing on admissibility, permitting the ballistics examiner to testify only that a firearms match was

“more likely than not”²; United States v. Diaz, No. 05-167, 2007 WL 485967, at *11-12, 2007 U.S. Dist. LEXIS 13152, at *35-36 (N.D.Cal. Feb. 12, 2007) (Alsup, J.) (following four-day Daubert hearing, permitting testimony “to a reasonable degree of ballistic certainty”); United States v. Williams, 506 F.3d 151, 161-62 (2d Cir. 2007) (finding ballistics expert and that testimony were properly admitted but noting, “[w]e do not wish this opinion to be taken as saying that any proffered ballistic expert should be routinely admitted. Daubert did make plain that Rule 702 embodies a more liberal standard of admissibility for expert opinions than did Frye v. United States, 293 F. 1013, 1014 (D.C. Cir. 1923)). United States v. Monterio, 407 F.Supp.2d 351, 355 (D. Mass. 2006) (finding firearms and toolmark identification evidence admissible under Daubert but holding specific conclusions of proffered firearms examiner inadmissible because they failed to comport with standards for documentation and peer review); United States v. Green, 405 F.Supp.2d 104, 122, 124 (D. Mass. 2005) (holding that expert's toolmark testimony was admissible, despite concerns about subjective testing methods and lack of evidence as to error rates in field, but limiting testimony to expert's observations and not conclusions “that the match he found by dint of the specific methodology he used permits ‘the exclusion of all other guns’ as the source of the shell casings”).

The problems with firearm and toolmark identification are particularly pronounced where no firearm is recovered, as is the case here. Moreover, even where firearms and toolmark identification may be scientifically reliable, in reaching his conclusions about purportedly matching casings and bullets, the People’s proffered expert Detective Fontanez

² Although the Brown decision is not published, its holding by Judge Rakoff is cited in United States v. Glynn, 578 F.Supp.2d 567, 568-69, 575 (S.D.N.Y. 2008), and the transcripts of the Daubert hearing were incorporated by reference in that case.

employed a methodology that deviates from the standards of the field and he failed to preserve or document anything to support his conclusions.

Accordingly, this Court should preclude the People from offering any expert testimony on firearms and toolmark identification. If the Court permits such testimony, Detective Fontanez should not be allowed to opine as to a match of ammunition components as being fired from the same firearm or claim statistical certainty of such a match because the method by which the NYPD determines likelihood of match is not generally accepted in the relevant scientific community and the specific firearms and toolmark identification protocols that are generally accepted were not followed in this case.

ARGUMENT

I. UNDER THE FRYE STANDARD, THE FIELD OF FIREARMS AND TOOLMARK IDENTIFICATION DOES NOT PRODUCE RESULTS ACCEPTED AS GENERALLY RELIABLE IN THE RELEVANT LEGAL AND SCIENTIFIC COMMUNITIES

A. Despite a History of Admission, Firearms and Toolmark Identification Is No Longer Generally Accepted in the Relevant Scientific and Legal Communities and a *Frye* Hearing Is Warranted

New York courts have adopted the test set forth in Frye for the admission of scientific evidence. People v. Wesley, 83 N.Y.2d 417, 422-23 (2004) (citing Frye v. United States, 293 F. 1013, 1014 (D.C. Cir. 1923)). The Frye test poses the elemental question of “whether the accepted techniques, when properly performed, generate results accepted as reliable within the scientific community generally.” People v. LeGrand, 8 N.Y.3d 449, 457 (2007) (internal quotations omitted).³

³The Court of Appeals has noted that Daubert v. Merrell Dow Pharmaceuticals Inc., 509 U.S. 579 (1993), which relaxed the rule of Frye and the “traditional barriers to □ ‘testimony’ under the Federal Rules of Evidence, is not

Firearms and toolmark identification evidence and testimony have historically been accepted in courts. See United States v. Scheffer, 523 U.S. 303, 312-13 (1998); United States v. Santiago, 199 F.Supp.2d 101, 111-13 (S.D.N.Y. 2002); People v. Rogers, 86 Misc.2d 868, 876 (Sup. Ct., N.Y. Co. 1976). As the United States District Court for the District of Massachusetts recently acknowledged, however, in light of increased questioning of the methods underlying firearms and toolmark identification and problems with the field itself, unquestioned admission should cease. See United States v. Green, 405 F.Supp.2d 104 (D. Mass. 2005).

Courts must revisit the reliability of proffered “scientific evidence” with the understanding that acceptance of forensic techniques and expert opinions may change over time. See generally People v. Mooney, 76 N.Y.2d 827 (1990); People v. Lee, 96 N.Y.2d 157 (2001); People v. LeGrand, 8 N.Y.3d 449 (2007) (illustrating the progression of acceptance of expert testimony on eyewitness identification over time upon numerous revisitations; from *per se* inadmissible to discretionary to *per se* admissible).

A Frye hearing is appropriate even if the Court of Appeals and other New York courts have already permitted similar testimony. See LeGrand, 8 N.Y.3d at 449 (no error where trial court conducted Frye hearing in 2002 even though Court of Appeals had ruled on the scientific technique at issue in 1990). A Frye hearing is required where the motion papers raise an issue of fact as to the general acceptance of a scientific theory. Cf. Saulpaugh v. Krafte, 5 A.D.3d 934 (3d Dept. 2004).

Recent federal cases that revisited the admissibility of firearms and toolmark identification under the more liberal federal standard of Daubert have determined that

applicable in New York.” Wesley, 83 N.Y.2d at 422 (quoting Daubert, 509 U.S. at 588-89); see also Zito v. Zabarsky, 28 A.D.3d 42, 43-44 & n.1 (2nd Dept. 2006).

ballistics evidence and firearms experts should not be routinely admitted, nor should firearms experts cease to be scrutinized merely because of past admission. See Williams, 506 F.3d at 161-62 (2d Cir. 2007) (“[w]e do not wish this opinion to be taken as saying that any proffered ballistic expert should be routinely admitted.”). Four recent federal court judges conducted Daubert hearings concerning the admissibility of firearms and toolmark identification evidence and, following a hearing, one excluded such testimony altogether and the other three limited such testimony based on concerns about the field and the reliability of the proffered expert’s conclusions.⁴ See Brown, 05 CR 538 (S.D.N.Y. June 9, 2008) (Rakoff, J.) (conducting a Daubert hearing and permitting expert testimony to opine only that a firearms match was “more likely than not”); Glynn, 578 F.Supp.2d at 574 (noting zero error rate of methodology and limiting expert testimony to opinion that match was “more likely than not”); Diaz, No. 05-167, 2007 WL 485967, at *11-12 (citing Monteiro’s conclusion that no scientific methodology exists to support a finding of a match to an absolute certainty, but permitting testimony “to a reasonable degree of ballistic certainty in the ballistics field”); Monterio, 407 F.Supp.2d at 355 (refusing to admit expert testimony on firearms and toolmark identification based on lack of peer review and documentation); Green, 405 F.Supp.2d at 122 (noting scholarly literature is “extraordinarily critical” of discipline of firearms and toolmark identification and addressing concerns about subjective testing methods and lack of evidence as to error rates in field, and limiting expert testimony to observations without conclusions).

As the court in Glynn explained, “[b]ased on the Daubert hearings this Court conducted in Brown and Glynn, the Court very quickly concluded that whatever else ballistics identification analysis could be called, it could not fairly be called ‘science[.]’” that “ballistics

⁴ In Glynn, Judge Rakoff referenced the extensive Daubert hearing and decision in Brown and therefore a total of four judges issues five decisions excluding of limiting firearms and toolmark identification evidence.

opinions are significantly subjective[,]” and “that ballistics examination not only lacks the rigor of science but suffers from greater uncertainty than many other kinds of forensic evidence.” 578 F.Supp.2d at 570, 574. The court in Diaz similarly summarized the “problem of absolute testability in firearms identification” as follows: “[b]ecause the accepted practice in the field is based on a subjective assessment, in actual case work it is impossible to conclusively state that an examiner’s conclusion is correct or incorrect.” 2007 WL 485967 at *5.

The extensive Daubert hearings in these cases that revealed substantial limitations in the field of firearms and toolmark identification and the decisions remove the field’s veneer of reliability. Significantly, the exclusion and substantial limitations on expert testimony in these federal cases occurred under the more liberal Daubert standard. Moreover, as noted by the court in Green, the scholarly literature is “extraordinarily critical” of the discipline. 405 F.Supp.2d at 122 & n.33 (citing Adina Schwartz, A Systemic Challenge to the Reliability and Admissibility of Firearms and Toolmark Identification, 6 Colum. Sci. & Tech. L.Rev. 2 (2004-2005)); see also NRC Ballistics Imaging Report; NRC Forensic Science Report. When “there is marked conflict in the judicial and legal authorities as to the reliability of the procedure,” courts lack a proper basis for admitting testimony without a preliminary inquiry into reliability. People v. Jeter, 80 N.Y.2d 818 (N.Y. 1992).

In light of the increased skepticism of firearms identification by the relevant scientific and legal communities, including the research branch of the federal government, and in light of the increased prohibition and limitation of its use in courts, New York state courts must re-evaluate the general acceptance of firearms identification for purposes of satisfying the Frye standard.

1. **The Frye framework for admissibility of scientific evidence is the governing legal standard for firearms and toolmark identification evidence**

Under the Frye standard, the burden of proving general acceptance rests upon the party offering the disputed expert testimony. Saulpaugh, 5 A.D.3d at 935. “Broad statements of general scientific acceptance, without accompanying support, are insufficient to meet the burden of establishing such acceptance.” Id. (citing Stanski v. Ezersky, 228 A.D.2d 311, 312 (1st Dept. 1996)).

Even if a court determines that the accepted techniques, performed as they should be, generate results generally accepted as reliable within the scientific community, it must then determine whether the laboratory actually employed the accepted techniques. People v. Middleton, 54 N.Y.2d 42, 45 (1981).

2. **The appropriate community for a Frye analysis must include firearms and toolmark examiners as well as those with relevant legal or scientific expertise**

In evaluating “general acceptance” of firearms and toolmark identification evidence, many courts have only given weight to firearms examiners themselves. See Monteiro, 407 F.Supp.2d at 372. Firearms examiners, however, (1) are biased about the theory’s reliability because they are doing that type of work, and (2) have a vested interest in the continued viability of the field. As the Court of Appeals warned, a Frye court should be particularly cautious when “the supporting research is conducted by someone with a professional or commercial interest in the technique.” Wesley, 83 N.Y.2d at 440 (Kaye, J., concurring). “[I]f the field is too narrowly defined, the judgment of the scientific community will devolve into the opinion of a few experts.” Wesley, 83 N.Y.2d at 438 (Kaye, J., concurring). Specifically, the field *must* include those familiar with the proffered evidence, based on both actual and

theoretical evidence “to comply with the Frye objective of containing a consensus of the scientific community.” Wesley, 633 N.E.2d at 438 (Kaye, J. concurring). The relevant field when considering whether the theory of firearms and toolmark identification is generally accepted should include not only firearms examiners, but other scientists capable of understanding the premises of the theory and their workability; legal opinions as evidenced by the courts; and other legal scholars familiar with the scientific and legal literature on the subject of firearms and toolmark identification.

B. An Overview of Firearms and Toolmark Identification

Firearms and toolmark identification is the comparison of toolmarks on various objects to determine a “match”. Firearm components (firing pins, barrels, etc.) leave marks on discharged ammunition components (bullets, cartridge cases, etc). Thus, a “toolmark” is the mark left by a firearm on an ammunition component. Some of these marks are the result of the manufacturing process and some come with use and wear. A firearms examiner compares toolmarks on ammunition components recovered from a crime scene with test toolmarks produced on other ammunition components created by test firing a particular firearm. If no firearm is recovered, firearms examiners sometimes compare ammunition components recovered from a crime scene to each other to see if they are so similar that they were fired or cycled through same firearm. In either case, the goal is to determine whether there is a “match”, meaning a particular piece of ammunition matches a particular firearm or other piece of ammunition. If a firearms examiner determines a match, the conclusion is that the toolmarks are so similar that one tool must have produced both. The underlying theory of firearms and toolmark identification is that each firearm produces some toolmarks on its

ammunition components that will not be found on ammunition components fired from any other firearm. See Schwartz Aff. at ¶ 7.

Toolmarks fall into one of two classes: (1) striated toolmarks (patterns of scratches or striae produced by parallel motion of tools against objects (gun barrel marks)); and (2) impression toolmarks (marks produced on objects by the perpendicular, pressurized impact of tools (firing pin and breechface marks on cartridge casings). Id. at ¶ 10. Both have class, subclass and individual characteristics.

The first level of comparison for a firearms examiner is as to “class characteristics,” generally created during the firearm manufacturing process, such as whether the compared objects share the same rifling impression. Rifling impressions are raised and indented impressions called “lands” and “grooves” marks inside the barrel of a firearm, as well as the direction of twist of the lands and grooves. Class characteristics are distinctively designed features of tools as reflected in a toolmark. Id. at ¶ 11. By identifying class characteristics, a firearms examiner narrows down the pool of candidates for determining a common source. The pool of potential sources is often narrowed using “General Rifling Characteristics (“GRC”).” Id. Presently, the FBI publishes GRCs once a year and they list the characteristics common to a certain class of firearm. All tools of certain type share class characteristics, like rifling of number, width and direction on twist of lands and grooves in types of barrels.

Once a smaller pool of types of firearms is identified, an examiner will use a microscope to compare the “individual characteristics” of a toolmark, such as microscopic striations within rifling impressions. Id. at ¶ 7. These are generally created by random imperfections or irregularities on the tool caused by the manufacturing process and/or use,

wear, corrosion or damage. Microscopic individual characteristics are what are purported to be unique to each individual tool and correspond to. Id. at ¶11.

In addition to class and individual characteristics, in 1985, the Association of Firearms and Toolmark Examiners (“AFTE”) introduced the term “subclass characteristic” to define any characteristic that is more restrictive than a class characteristic, but is not unique to one firearm only. Id. at ¶ 21 (citing NRC Ballistics Imaging Report, at 58). Subclass characteristic refers to the surface feature of an object that is: (1) produced incidental to manufacture, (2) significant in that it relates to a small group source, or (3) can arise from a source that changes over time. Id. Subclass characteristics need to be ruled out before a toolmark can be declared an individual characteristic. Id. (“caution should be exercised in distinguishing subclass characteristics”).

C. The Two Essential, Underlying Premises of Firearms and Toolmark Identification – the Uniqueness and Reproducibility of Toolmarks – Cannot Be Proven

The entire field of firearms and toolmark identification is based on two essential premises: (1) that a tool leaves a **unique toolmark** on an object; and (2) that toolmarks are **reproducible**. See Schwartz Aff. at ¶ 6. To be useful at all for identification, these two underlying premises must be true. See NRC Ballistics Imaging Report, at 71-72.

Current studies have called both underlying premises into serious question demonstrating that firearms and toolmark identification does not produce results that have general acceptance in the relevant scientific and legal fields. In 2008, the National Research Council Committee to Assess the Feasibility, Accuracy, and Technical Capability of a National Ballistics Database found that the basic premises of firearms and toolmark identification were not scientifically established. **“Finding: The validity of the fundamental**

assumptions of uniqueness and reproducibility of firearm-related toolmarks has not yet been fully demonstrated.” NRC Ballistics Imaging Report at 3, 81 (emphasis in original).

According to the Committee, extensive research would be needed to validate the assumptions:

Additional general research on the uniqueness and reproducibility of firearm-related toolmarks would have to be done if the basic premises of firearms identification are to be put on a more solid scientific footing.

Fully assessing the assumptions underlying firearms identification would require careful attention to statistical experimental design issues, as well as intensive work on the underlying physics, engineering and metallurgy of firearms, but is essential to the long-term viability of this type of forensic evidence.

Id. at 82; see also NRC Forensic Science Report at 5-21 (quoting the NRC Ballistics Imaging Report's findings).

These negative conclusions about the underlying premises of firearms and toolmark identification are particularly noteworthy because the National Research Council is the operating agency of the National Academy of Sciences, an independent body of distinguished scientists that Congress established in 1863 for the purpose of advising federal government agencies on scientific and technical questions.

It is scientifically questionable that each tool produces a unique toolmark because manufacturing creates batches of tools with matching microscopic characteristics, called subclass characteristics. See Schwartz Aff. at ¶¶ 11, 12. Some tools do develop individual, unique toolmarks but others have both subclass and individual characteristics. Presently, individual parts of firearms are manufactured before they are put together on the assembly line, and this supports the claim that guns made consecutively will often share characteristics of others in the same batch and not have unique characteristics. See NRC Ballistics Imaging Report at 70. The few studies that have been done on the existence of subclass characteristics

show that they are often present on bullets, and almost always present on cartridge cases. Id. at 71-72. The idea that *every* gun has unique markings is “inconsistent with established knowledge within the discipline that not all manufacturing processes result in firearms or other tools with such differentiated surfaces that each tool produces toolmarks with unique, individual characteristics.” Schwartz Aff. at ¶ 12. Additionally, the claim of uniqueness has not been put to the “rigorous testing that science demands.” Glynn, 578 F.Supp.2d at 573.

The same can be said for the claim of reproducibility. See NRC Ballistics Imaging Report at 72. To claim that toolmarks are reproducible, an individual characteristic left by a firearm must be capable of being deposited over multiple firings so that they can be found on recovered evidence and compared with toolmarks on test-fired ammunition. Id. Again, reproducibility has not been sufficiently proven. Id. at 81 (summarizing studies finding various capabilities of reproduction on pages 72-75).

As a result of the inability to prove either uniqueness or reproducibility, courts are now starting to realize that the entire foundation upon which firearms analysis rests has never been scientifically tested to any significant degree. See Glynn, 578 F.Supp.2d at 572 (“while the assumptions of uniqueness have never been definitively tested, in an earlier era when guns were hand-made this may have been self-evident. Now, however, when guns are mass-produced with ever greater precision, they have become more regular.”). Accordingly, this Court should preclude firearms and toolmark identification evidence because the twin premises on which the field is based have not been scientifically proven and the discipline does not generate results accepted as reliable within the scientific community generally.

D. Even if the Underlying Premise of Firearms and Toolmark Identification Could Be Scientifically Proven, Firearms and Toolmark Identification Remains Scientifically Unsound.

Even if research could support underlying premise that firearms produce unique and reproducible toolmarks, three major difficulties complicate firearms examiners' goal of identifying one tool as the source of a particular match, reflecting a great chance of misidentification. This great chance for misidentification mandates exclusion of such evidence since the field of firearms and toolmark identification does not produce reliable results, as required by Frye.

1. The chance of misidentification is great because of the ambiguous use of the term "individual characteristics"

The term "individual characteristics" is used to refer to the "entire unique microscopic mark" produced by individual tools and the "component microscopic marks" which are not themselves unique to any tool, but which come together as a pattern to make the microscopic marks that are unique to a specific tool. Schwartz Aff. at ¶ 13. As early as 1935, firearms experts recognized that "each element of a firearm's signature may be found in the signatures of other firearms." Id. (citing JACK D. GUNTHER & GUNTHER, THE IDENTIFICATION OF FIREARMS 90-91 (1935)). Due to "overlapping individual characteristics of the toolmarks made by different tools, misidentifications may result because examiners assume that a certain amount of resemblance proves that the same tool produced both test and evidence toolmarks, when the same amount of resemblance is possible between toolmarks produced by different tools." Id. at ¶ 14. Examiners can ascribe too much significance to a small amount of matching striae and not appreciate that such agreement is achievable in known non-match comparisons. Id. at ¶ 14. "Starting in the 1990's, use of the Integrated Ballistics Identification System (IBIS), a computerized comparison system for

bullets and cartridge cases, led to increased awareness of the danger that examiners might erroneously conclude that toolmarks were made by the same tool when they were in fact made by different tools.” Id. Indeed, misidentifications do result. See Williams v. Quaterman, 551 F.3d 3452, 355-56 (5th Cir. 2008) (Houston Police Department firearms and toolmark examiner mistakenly concluded that the defendant’s .25-caliber pistol, rather than the cooperating witness’s .22-caliber pistol, had fired the bullet recovered from decedent’s head). “The similarities between known non-matching toolmarks were sometimes so great that even under a comparison microscope, it was difficult to tell the toolmarks apart and not erroneously attribute them to the same gun.” Schwartz Aff. at ¶ 14. The similarity of the toolmarks left on bullets by different guns creates a great chance of misidentification.

2. Marks a tool make change over time

It is readily accepted that toolmarks change over time and in fact, firearms examiners do not expect toolmarks left on ammunition components fired from the same firearm to ever be exactly alike. Id. at ¶ 16. “The changes in toolmarks reflect the changes in a tool’s surfaces that occur as the tool is used and/or as damage or corrosion occur.” Id. Additionally, difference among the toolmarks a particular gun leaves on ammunition are caused by intrinsic variation in the “pressures and velocities” involved in firing a firearm. Id. Further, the same firearm will likely leave different marks on bullets and cartridge cases of different makes. Id. As a result of the impermanence of toolmarks, differences between evidence and test toolmarks will sometimes be the result of changes in the tool between the times the marks were made and sometimes because the tools used were similar, but not identical. Id. (citing Biasotti, A Statistical Study, at 37-38 (finding matches of 21-38% on bullets fired from the same .38 Special Swith & Wewson revolver and matches of 15-20% on bullets fired from

different .38 Special Smith & Wesson revolvers). “This near-complete overlap in the amount of similarity in toolmarks produced by the same and different guns strongly suggests that examiners can make misidentifications by wrongly attributing differences between toolmarks made by different tools to changes in the same tool over time.” Id. Also, real life conditions often will not allow for perfect comparison of toolmark to tool, or two different toolmarks to each other. Glynn, 578 F.Supp.2d at 573. Bullets and/or shell casings recovered often are damaged, fragmented, crushed, or otherwise distorted in ways that will make toolmarks harder to examine; or create new marks that were not originally left by the firearm. Id. The chance of misidentification is great because toolmarks change over time.

3. **Misidentification may result if an examiner confuses subclass characteristics of toolmarks produced by more than one tool with individual characteristics of toolmarks produced by one and only one tool**

The existence of subclass and individual characteristics means that the microscopic striations on bullets may be subclass characteristics, rather than individual characteristics, which can lead to false positives and false negatives. Id. at ¶18. Failing to consider subclass characteristics creates a great risk of misidentification. Id. at ¶ 21. The term “subclass characteristics” was coined after misidentifications of striated toolmarks in real cases in the 1980’s. Id. (citing Bruce Moran, *A Report on the AFTE Theory of Identification and Range of Conclusions for Tool Mark Identification and Resulting Approaches to Caseworks*, 34 (2) AFTE J. 227, 227-28 (Spring 2002)). Though the AFTE specifies “caution should be exercised in distinguishing subclass characteristics from class characteristics,” it does not offer any guidelines about how to prevent potential confusion. See Monteiro, 407 F.Supp.2d at 371. “There are thousands of firearms that may share the same subclass.” Green, 405 F.Supp.2d at 111 (citing Daubert Hr’g Tr. 16-17, Nov. 2, 2005). Though class characteristics

are fairly easy to identify, because they are common to the design of the type of gun itself, subclass characteristics are often hard to identify, as they may be common to batches of firearms manufactured around the same time, or by the same machine. Examiners have not developed criteria explaining which types of tools can be expected to produce subclass or individual characteristics when they are newly manufactured. *Id.* at ¶ 19. Additionally, they have not developed criteria detailing the rate at which any subclass or individual characteristic can be expected to change over time. *Id.* Thus, examiners rely on only their personal experience with firearms to determine if a toolmark is individual to a firearm or a subclass characteristic common to many. *Id.* An examiner has no chance of identifying a subclass characteristic unless he or she is familiar with types of forming and finishing processes and their reflections in toolmarks. *Id.* at ¶ 21.

Moreover, the problem of subclass characteristics is exacerbated in cases where no weapon is recovered. When the only evidence collected is ammunition components but not a firearm from which to test fire comparison components, firearms identification is at its most unreliable because subclass characteristics cannot be accounted for. *Id.* at ¶ 20. “[O]n the basis of studies finding subclass, rather than individual, characteristics on firing pin impressions and breech face marks, prominent firearms and toolmark examiners have warned that reliable firearms identifications cannot be based on either of these marks alone.” *Id.* at 19 (citing Bonfanti & DeKinder, *supra*, at 5 (“A probable solution to th[e] problem [of misidentifications resulting from confusing subclass with individual characteristics] lies in a comparison of all the marks present on a cartridge case (breech face impressions, firing pin impression, ejector mark, extractor mark, and marks generally by dynamic processes).”)); Nichols, *Defending the Scientific Foundations*, *supra*, at 588 (stating that “firearms and tool

mark examiners are aware that [firing pin impressions] are not wholly reliable for identification to a specific firearm,” and that “Breech face marks can be cut, milled or stamped. In each case, subclass characteristics may be produced.”)). Accordingly, shell casings should not be used as the basis for a comparison in the absence of the recovery of a weapon.

In light of the increased efficiency by which firearms are produced, and the better durability they are designed to have, the problem of subclass characteristics will only get worse. See Schwartz Aff. at ¶ 21. The existence of subclass characteristics and the absence of guidelines leading examiners to correctly distinguish between subclass and individual characteristics also leads to a great risk of misidentification.

E. Firearms and Toolmark Identification Is Inherently Probabilistic and Subjective

The three problems of firearms analysis discussed above that reflect the great chance for misidentification also demonstrate that identity determinations are inherently probabilistic: “On the one hand, substantial resemblance between toolmarks produced by different tools may result from shared subclass characteristics or from similarities between the marks comprising the individual characteristics of toolmarks. On the other hand, because the surfaces of tools change over time, even toolmarks made by the same tool do not perfectly match.” Id. at 22. The field is further plagued by an inability to produce reliable results because of its subjective nature that is unsupported by any statistical or empirical methods or universal standards for determining a match, and by the inadequacy of the existing proficiency tests for examiners.

1. **There is no reliable statistical method for determining whether the similarities between toolmarks are so great that they must have been produced by the same gun**

The National Research Council identified that a major limitation in the field of firearms and toolmark identification is that the decision of the examiner is completely subjective. See Schwartz Aff. at ¶ 9. There are no articulated standards by which to decide what statistical certainty should be given to a conclusion reached by an examiner. Id. (“Conclusions drawn in firearms identification should not be made to imply the presence of a firm statistical basis when none has been demonstrated” (quoting NRC Ballistics Imaging Report)). There is no use of probability studies and statistics in the field of firearms and toolmark identification period. Monteiro, 407 F.Supp.2d at 363. The National Research Council noted that extensive empirical and statistical work is needed to support identity conclusions, and that this type of work has not been done for any forensic science except for DNA identification. See Schwartz Aff. at ¶ 24. The decision of firearms examiners does not rest on a statistical foundation for estimation of error rates or accepted criteria for determining a match. Id. at ¶ 23. Accordingly, the Ballistics Imaging Report concluded, “*Conclusions drawn in firearms identification should not be made to imply the presence of a firm statistical basis where none has been demonstrated.*” at 82. The field completely lacks statistical data to permit formulation of precise criteria for distinguishing between identity and nonidentity with any reasonable degree of certainty.

2. **A match is not necessarily a match because there is no universal agreement on how much similarity between marks leads to a conclusion of a “match”**

Since firearms identification ultimately comes down to a subjective assessment, there is no consensus within the field of firearms examiners about what degree of similarity is

needed between a toolmark and firearm or two toolmarks, in order to declare a match. See Monteiro, 407 F.Supp.2d at 369. “Toolmark analysis does not follow an objective standard requiring a certain percentage of marks to match at all.” Id. at 370.

The AFTE Theory of Identification states that there is an exceedingly small likelihood that any tool besides the suspect tool produced the evidence toolmark(s) when “the observed agreement between test and evidence toolmarks is superior to that of the best known non-match and consonant with that of the best known match.” Schwartz Affir. at ¶ 26. There are two major problems with this definition of when a match occurs. First, there is no objective criteria by which an examiner can declare a match. Id. As the NRC Forensics Science Report summarized:

A fundamental problem with toolmark and firearms analysis is the lack of precisely defined process. . . .AFTE has adopted a theory of identification, but it does not provide a specific protocol. . . . The meaning[s] of ‘exceeds the best agreement’ and ‘consistent with’ are not specified, and the examiner is expected to draw on his or her own experience. This AFTE document, which is the best guidance available for the field of toolmark identification, does not even consider, let alone address, questions regarding variability, reliability, repeatability or the number of correlations needed to achieve a given degree of confidence.

5-21.

Second, “there is no universal agreement as to how much correspondence exceeds the best known nonmatching situation.” See Schwartz Aff at ¶ 26 (quoting Ronald G. Nichols, *Defending the Scientific Foundations of the Firearms and Tool Mark Identification Discipline: Responding to Recent Challenges*, 52(3) J. Forens. Sci. 586 (May 2007)). This means that different examiners will have different ideas of what constitutes a “best known match” Id. Inevitably, this will lead to some examiners declaring a match when other would have concluded otherwise. There have been attempts to introduce minimum standards and protocols into the field of firearms analysis for the purpose of determining whether the

agreement between two pieces of evidence is “sufficient to constitute a match,” but “such attempts have not yet met with general acceptance.” Glynn, 578 F.Supp.2d at 574. In fact, the Southern District has recognized that this type of firearm analysis suffers from greater uncertainty than many other kinds of forensic evidence. Id. at 574.

The traditional method of analysis is the “I know it when I see it” method based on a mind’s eye assessment which is inherently subjective. Some examiners have recently adopted the CMS (consecutive matching striae) criterion, which was developed in 1997. See Schwartz Affir. at ¶ 27. “CMS is most favorably viewed as an attempt to use statistical empirical studies to formulate a cut-off point of numbers of consecutive matching striae at which the likelihood that another tool would produce toolmarks that do as good a job at matching the evidence toolmark as the toolmarks produced by the suspect tool is so exceedingly small that, for all practical purposes, the suspect tool can be identified as the unique source of the evidence toolmark.” Id. at ¶ 31. CMS is also highly imperfect because the idea that there is an absolute cut-off in terms of the number of consecutively corresponding striae that constitutes a match is unrealistic. Id. CMS identification criterion applies only to striated toolmarks, not to impression toolmarks such as firing pin impressions or breech face marks. Id. at ¶ 32. Also, the CMS criterion is intended to be applied to individual, rather than subclass, characteristics of toolmarks and, therefore, misidentifications will result if, in applying the criterion, examiners mistake subclass characteristics for individual characteristics. Id. CMS does nothing to decrease the difficulty of distinguishing between subclass and individual characteristics. Id. Moreover, line counting itself is an inherently subjective process that serves as the basis for this purportedly “objective” method. Id. at ¶ 33.

Whether the traditional method or CMS is employed, firearms and toolmark examiners may disagree about whether to reach an identification conclusion in a particular case since different firearms and toolmark examiners, as well as the same examiner over the course or time, are likely to have different mind's eye criteria. Id. at ¶ 36.

The lack of agreed-upon, objective criteria for resolving disputes means that an error rate cannot be calculated for the discipline. Id. at ¶ 37. When a dispute arises the decision about whether the conclusion will be a match or a non-match will differ from lab to lab. The method by which an examiner determines a match is necessarily subjective, and examiners who possess the “ineffable skill” of making correct judgments cannot necessarily pass that skill on to others, meaning that any error rate calculated would be only for a particular person, not for examiners as a whole. Id. Without information on error rate, there is no way that the factfinder can accurately evaluate the testimony. Green, 405 F.Supp.2d 104.

3. **The proficiency tests used to test the ability of individual examiners is insufficient and fails to provide an accurate estimate of day-to-day error rates**

The most commonly used proficiency test, and the one used by the NYPD, is the Collaborative Testing Services (“CTS”). See Schwartz Aff at ¶ 38. Examiners are given a firearm and various pieces of “evidence” and asked to conclude whether each piece is a “match,” “non-match,” or “inconclusive.” Because there is no specific criteria by which an examiner is to reach a conclusion, a proficiency test can only establish a particular examiner’s ability to reach correct conclusions at the specific time of testing; it says nothing about the proficiency of the examiner at a given date in the future. The CTS tests have two main problems. First, the tests are declared rather than blind which can skew results because examiners know they are being tested. See Schwartz Aff at ¶ 38. Examiners are likely more

careful and take more time in a particular “test” examination than they would under normal circumstances. It may also increase the likelihood that an examiner concludes a piece of evidence is inconclusive for fear of making a false-positive determination, when during a real-life examination the conclusion may have been a “match.” The second problem is that the tests present examiners with simpler problems than they encounter in actual casework. Id.

CTS itself cautions that its tests “are not intended to be an overview of the quality of work performed in the profession and cannot be interpreted as such.” Id. The test themselves show, however, that mistakes and misidentifications are made. Id. at 26-27. Also, if an examiner reaches an “inconclusive” in regard to toolmarks that were in fact made by the same or different tool, it is not scored as an error. If “inconclusives” are counted as a wrong answer, or discounted altogether, the error rate would be higher than the error rate as calculated and reported presently. See Joseph L. Peterson & Penelope Markham, *Crime Laboratory Proficiency Testing Results, 1978-1991*, II, 40 J. Forens.Sci. 1009, 1010, 1019, 1024 (1995) (reporting that when inconclusives were counted as errors, the error rate for firearms identification tests from 1978-1991 was 12%, and for toolmark identification tests from 1981-1991 was 26%).

The underlying premise of firearms and toolmark identification has not and cannot be scientifically proven. Even if it could, the discipline is plagued by the ambiguous use of the term “individual characteristics”, by the inherent changing nature of toolmarks over time and the confusion between subclass and individual characteristics. Each of these three problems create a great risk of misidentification that reflects the unscientific nature of the field due to its failure to produce reliable results. Moreover, the discipline is entirely subjective and probabilistic and lacks necessary statistical backing, error rates, or adequate proficiency

testing. Accordingly, this Court must preclude the prosecution from offering any firearms and toolmark identification evidence or expert opinion in this case as to a purported match of ammunition components as being fired from the same firearm.

II. TO THE EXTENT THAT STANDARDS AND PROTOCOLS DO EXIST FOR FIREARMS AND TOOLMARK IDENTIFICATION, THEY WERE NOT FOLLOWED IN THIS CASE AND THIS COURT SHOULD PRECLUDE DETECTIVE FONTANEZ FROM TESTIFYING

Even if a court determines that the Frye standard has been satisfied as to firearms and toolmark identification, the inquiry then becomes whether or not the expert in this case followed the generally accepted techniques. Middleton, 54 N.Y.2d at 50. Mr. Eligio maintains that the field of firearms and toolmark identification is not generally accepted in the relevant communities. However, to the extent that some specific guidelines are generally accepted, the NYPD examiner here, Detective Fontanez, did not follow them in this case.

First, and most importantly, all toolmark examiners, relevant forensic scholars, and courts have determined that detailed documentation is *absolutely necessary* in order to preserve the jury its factfinding duty of making conclusions. No documentation was done in this case to support the purported "conclusions" of Detective Fontanez, thereby subverting the role of the jury. Second, there was inadequate peer review and examination of the firearms evidence, as is suggested by the AFTE. Third, there was no attempt to rule out subclass characteristics in this case, which is recommended as necessary and crucial by the relevant community. Fourth, to the extent that there was an attempt to rule out subclass characteristics, the absence of a firearm for comparison, as well as the use of only breech marks and firing pin impressions for comparison, makes it even more difficult to rule out subclass characteristics. It is widely accepted that both firing pin impressions and breech

marks have subclass characteristics but none were considered here. There is also consensus that an examiner should hesitate in making conclusions about match when the ammunition components are damaged as the markings on the evidence could have come from whatever impact subsequent to firing caused the damage. All of the ammunition components here suffered damage and should not have served as the basis for a comparison or match.

A. Detective Fontanez's Conclusions Are Not Supported by Bench Notes or Microscopic Photographs

The standard in the field of firearms and toolmark identification is documentation of each and every observation that led to an examiner's conclusions. See Schwartz Aff at ¶ 43. Courts and scientists alike have strictly maintained that thorough documentation is needed for purposes of peer review and so the trier of fact can assess for themselves the reliability of any conclusive testimony. Id. As two federal courts have made clear, firearms examiners cannot be permitted to testify absent documentation supporting their examination. The court in Montiero explained:

the process of deciding that a cartridge case was fired by a particular gun is based primarily on a visual inspection of patterns of toolmarks, and is largely a subjective determination based on experience and expertise. Because of the subjective nature of the matching analysis, a firearms examiner must be qualified through training, experience, and/or proficiency testing to provide expert testimony. Moreover, an examiner must follow the established standards for intellectual rigor in the toolmark identification field with respect to documentation of the reasons for concluding there is a match (including, where appropriate, diagrams, photographs or written descriptions), and peer review of the results by another trained examiner in the laboratory. These standards ensure the reliability of the expert's results and the testability of the opinion.

407 F.Supp.2d at 355 (holding under the less stringent standard of Daubert, that firearms evidence and testimony about a match was not admissible due to absence of photographs and notes documenting how a conclusion was reached).

Similarly, in Brown, a case involving the same firearms analyst as this case, NYPD

Detective Fontanez, the court noted the following:

the Government's expert, Detective Luis Fontanez, initially proposed to effectively deprive the jury of any role whatever by testifying to his conclusions without presenting to the jury any photographs of the microscopic comparisons he performed in the course of his analysis, thereby preventing the jury from making the comparisons for itself. Had the Government persisted in this position, the Court would not have admitted the testimony at all; however, the Government subsequently agreed to present such photographs

Glynn, 578 F.Supp.2d at 574 n.13

Until and unless the basis for the identification is described in such a way that the procedure performed by the examiner is reproducible and verifiable, it should not be admissible. Here, Detective Fontanez's conclusions of various matches are not supported by any documents -- no bench notes, microphotographs, or other details about how he reached his conclusions. Not only are there no notes or microscopic photographs, but there are no details about what toolmarks were assessed, how they compared to each other, or whether subclass characteristics were even considered. All Detective Fontanez maintains is that there is a purported "match" based on sufficient agreement of class and individual characteristics, but there is not even an explanation of exactly what those characteristics are or what sufficient agreement meant in this instance. The court in Green predicted that "the more courts admit this type of toolmark evidence without requiring documentation, proficiency testing, or evidence of reliability, the more sloppy practices will endure; we should require more."

Green, 405 F.Supp.2d at 109.

The complete lack of supporting documentation for Detective Fontanez's conclusions warrants exclusion.

B. This Case Lacked Adequate Peer Review

The peer review of Detective Fontanez's conclusions was inadequate because the reviewer simply signed that he verified the report without any supporting photographs, diagrams or notes reflecting the basis for his agreement, as required. In addition, the field standard requires a case review to be done by a minimum of two personnel. See Schwartz Aff. at ¶ 45. There is a line on Officer Fontanez's report where a second reviewer *could* sign, but that is in fact left blank. Because only one person completed review in this case, Detective Fontanez's results should not be admitted.

C. Detective Fontanez Did Not Attempt to Rule Out Subclass Characteristics

One of the few wholly accepted guidelines of firearms identification as stated by the AFTE: "Caution should be exercised in distinguishing SUBCLASS CHARACTERISTICS from INDIVIDUAL CHARACTERISTICS." Schwartz Aff. ¶ 21. Detective Fontanez in this case did not make any attempt to identify, or rule out, subclass characteristics. See Schwartz Aff. ¶ 46. Particularly troubling is the fact that no attempt was made to even identify what makes and models of guns could have fired the evidence in this case. Id. The FBI publishes "general rifling characteristics" each year, which can help examiners identify, to some extent, subclass characteristics that are in the FBI's publication. See Green, 405 F.Supp.2d at 112. However, no such report or comparison to such report was submitted to defense in this case. As discussed above, no examiner could rule out subclass characteristics without understanding and accounting for manufacturing techniques. The completely subjective assessment made by Detective Fontanez is inadmissible since it failed to account for the possibility of subclass characteristics.

D. To the extent that there was attempt to rule out subclass characteristics, it is impossible to eliminate them in a case such as this where there is no firearm for comparison and some ammunition components were damaged

In the absence of a recovered firearm for comparison, examiners cannot rule out subclass characteristics that can result in a false positive. See Schwartz Aff. ¶ 20.

Additionally, scholars have agreed that there is a “great likelihood” that both firing pin impressions and breech face marks have subclass characteristics. Id. at ¶¶ 19, 47. In situations where these are the only marks examined, prominent firearms and toolmark examiners have warned that reliable identifications cannot be based on either of these marks alone. Id. at ¶ 18. Detective Fontanez’s conclusions that the five 45 caliber shell casings were fired from the same gun should not be admitted because no firearm was recovered from which to rule out subclass characteristics that firearms scholars agree are generally present on firing pin and breechface impressions in shell casings.

Additionally, the failure to recover a gun caused another basis for the inadmissibility of Detective Fontanez’s conclusions. Two shell casings may be different, even if they are fired from the same gun, because successive firings can produce different marks. Green, 405 F.Supp.2d at 111. Particularly, successive firings from the same gun can produce two different firing pin marks if the firing pin does not retract fast enough, “turn[ing] that round impression into a T-hole shape.” Id. The fact that there was no gun recovered in this case means that no test fires were done, and no comparisons made to determine whether or not the firing pin would leave the same toolmark after successive fires. For this reason, Detective Fontanez’s conclusions should be excluded.

Lastly, Detective Fontanez’s conclusions about the allegedly “matching” bullets should not be admitted because a “deformed piece of copper jacket” was matched to a

“deformed piece of copper jacketed lead bullet.” See Schwartz Aff ¶ 48. Deformed ammunition components can result in new markings appearing on the ammunition through whatever post-firing assault created the deformities. Also, this can result in the obscuring of individual characteristics within the deformity, which are necessary for identification. Caution is advised when against concluding pieces of deformed or otherwise. Detective Fontanez disregarded this caution and concluded a match of deformed bullets. His conclusions are not reliable or accepted within the field of firearms identification and should be excluded.

CONCLUSION

Courts since the 1930's have admitted firearms and ballistics evidence and testimony, without much inquiry into the scientific foundations for the field's claims, or the reliability of its methods. This long history of admission does not mandate admission, however. This Court's important gate keeping function under Frye requires purportedly "scientific" evidence to be evaluated in a fluid spectrum, recognizing that the general acceptance of a discipline is not static. Federal courts have begun to raise the threshold for admitting firearms evidence under the less stringent Daubert standard. These courts have excluded or limited the strength experts can give to their conclusions, often permitting only descriptions of what ways the pieces of evidence are similar. Mr. Eligio urges this Court to grant a Frye hearing to determine whether firearms and toolmark identification as it is currently performed produces results that are accepted as reliable by the relevant community, and also whether accepted techniques were followed in this case.



V. Marika Meis
Attorney for Mr. Eligio

SUPREME COURT OF THE STATE OF NEW YORK
BRONX COUNTY, CRIMINAL DIVISION: PART 50

THE PEOPLE OF THE STATE OF NEW YORK

-against-

Defendant.

GIOVANNY ELIGIO,
Ind. No. 4097-08

STATE OF NEW YORK)
 ss.:
COUNTY OF NEW YORK)

AFFIRMATION OF ADINA SCHWARTZ

ADINA SCHWARTZ, being duly sworn, deposes and says:

1. I am a Professor in the Department of Law, Police Science and Criminal Justice Administration at John Jay College of Criminal Justice and in the Criminal Justice Ph.D Program of the Graduate Center, City University of New York (CUNY). John Jay College is the only liberal arts college in the United States devoted to criminal justice, and the CUNY Criminal Justice Ph.D. Program is the only Criminal Justice Ph.D. program in the country that has a forensic science track. As a faculty member at John Jay College, I teach many current and future law enforcement agents and significant numbers of current and future forensic scientists and forensic computing investigators. My duties include teaching evidence law to undergraduates and Criminal Justice Master's students and cyber-surveillance law to Forensic Computing and Criminal Justice Master's students at John Jay College. I teach a course, "Science, Experts and Evidence in the Criminal

Justice System,” for students in the forensic science track of the CUNY Criminal Justice Ph.D. Program.

2. I have published several articles on firearms and toolmark identification and, more generally, on the forensic identification sciences and on standards for the admission of scientific evidence. My article, *A Systemic Challenge to the Reliability and Admissibility of Firearms and Toolmark Identification*, 6 *Columbia Science & Technology Law Review* 1 (March 28, 2005), at <http://www.stlr.org/cite.cgi?volume=6&article=2> (“*A Systemic Challenge*”), was cited in *United States v. Mikos*, 539 F.3d 706, 711 (7th Cir. 2008), *United States v. Monteiro*, 407 F. Supp.2d 351, 360-61 *et passim* (D.Mass. 2006), and *United States v. Green*, 405 F. Supp. 2d 104, 122 n.33 (D. Mass. 2005). The article was also cited in the two recent National Research Council reports that consider the scientific basis for firearms and toolmark identification: Committee to Assess the Feasibility, Accuracy, and Technical Capability of a National Ballistics Database, *Ballistics Imaging* (2008) (“NRC Ballistics Imaging Report”) and Committee on Identifying the Needs of the Forensic Science Committee, *Strengthening Forensic Science in the United States: A Path Forward* (2009) (“NRC Forensic Science Report”). Links to *A Systemic Challenge* are posted on numerous websites, among them, the website of the Scientific Working Group on Firearms and Toolmarks (“SWGGUN”), <http://www.swggun.org/resources/viewpoints.htm>. The Weekly Detail, the Internet Newsletter for Latent Print Examiners, <http://www.clpex.com/Articles/TheDetail/200-299/TheDetail206.htm>, and the website of ballistics consulting company Athena Research & Consulting LLC, <http://www.athenahq.com/News/News%20Home.htm>. The

SWGGUN website also includes a link to another of my articles, *A Challenge to the Admissibility of Firearms and Toolmark Identifications: An Amicus Brief Prepared on Behalf of the Defendant in United States v. Kain, Crim. No. 03-573-1 (E.D. Pa. 2004)*, 4 Journal of Philosophy, Science & Law 1 (December 7, 2004), at <http://www6.miami.edu/ethics/jpsl/archives/all/kain.html> (“*A Challenge*”) as well as citations to two further articles of mine: *Challenging Firearms and Toolmark Identification-Part One*,” XXXII (8) The Champion 10 (Oct. 2008), and *Challenging Firearms and Toolmark Identification-Part Two*,” XXXII (9) 44 (November/December 2008). Firearms and toolmark examiners Bruce Moran and John Murdock have distributed and discussed *A Challenge* in workshops that they teach to firearms and toolmark examiners throughout the country. In their chapter, “Scientific Issues,” in 4 David L. Faigman, et. al, MODERN SCIENTIFIC EVIDENCE 592, 627 (2008-09), examiners Alfred Biasotti, John Murdock and Bruce R. Moran refer readers to the 2005 version of my since-updated chapter, “Firearms and Toolmark Identification,” in Jane Campbell Moriarty, *Psychological and Scientific Evidence in Criminal Trials*, West (2004 edition & ann. supp. 2006), Volume 2: 12-50 through 12-91, “[f]or a much less sanguine view” of the scientific issues about firearms and toolmark identification. Another of my articles, *A “Dogma of Empiricism” Revisited: Daubert v. Merrell Dow Pharmaceuticals, Inc. and the Need to Resurrect the Philosophical Insight of Frye v. United States*, 10 Harvard Journal of Law and Technology 149 (1997), was cited by the United States District Court for the Central District of California, the Alaska and Minnesota Supreme Courts, and the Florida Second District Court of Appeals. A copy of my *curriculum vitae* is attached hereto as Exhibit A.

3. I have served as a defense expert or consultant on firearms and toolmark identification in twenty-three cases, and I have testified at admissibility hearings in both state and federal courts.

4. In connection with this case, I have reviewed the discovery pertaining to firearms and toolmark identification that the government provided to defense counsel. This consisted of a two-page Microscopic Analysis Report, a Request for Laboratory Analysis Report, and a Property Clerk's Invoice.

5. This affidavit is respectfully submitted in order to apprise the Court of severe criticisms by scientists of both the underlying premises and methodology of firearms and toolmark identification, especially as voiced by two committees of distinguished scientists in the recent National Research Council Reports on Ballistics Imaging and Forensic Science. This affidavit is submitted as well in order to inform the Court of significant disagreements within the discipline of firearms and toolmark identification. In addition, this affidavit points out where the government's firearms and toolmark expert, NYPD Detective Luis Fontanez, employed a methodology that deviates from the standards of the field in reaching his conclusions that (i) five 45 auto caliber cartridge cases, LF1-5, were all fired from a single, unknown gun and (ii) a deformed piece of copper jacket (LF6) was fired from the same, unknown gun as a deformed piece of copper jacketed lead bullet (LF8).

6. Firearms identification, often improperly termed "ballistics," is part of the forensic science discipline of toolmark identification.¹ An underlying premise of toolmark identification is that a tool, such as a firearm barrel, leaves a unique toolmark(s)

¹ Properly speaking, ballistics deals with the motions of projectiles. See Paul C. Giannelli, *Ballistics Evidence: Firearms Identification*, 27 Crim. L. Bull. 195, 197 (1991).

on an object, such as a bullet. An equally crucial premise is that toolmarks are reproducible. As the National Research Council stated in its Report on Ballistics Imaging: "To be useful for identification, the characteristic marks left by firearms must not only be unique but reproducible – that is, the unique characteristics must be capable of being deposited over the multiple firings so that they can be found on recovered evidence and successfully compared with those on other items." Committee to Assess the Feasibility, Accuracy, and Technical Capability of a National Ballistics Database, *Ballistics Imaging* (2008) ("NRC Ballistics Imaging Report") at 72.

7. Firearms examiners compare evidence toolmarks on ammunition components recovered from crime scenes with test toolmarks that they produce on other ammunition components by firing or otherwise using a particular gun. If the same "class characteristics" are found on both the evidence and test toolmarks (for example, the same rifling impressions on a test fired bullet and an evidence bullet recovered from a crime scene), a firearms and toolmark examiner uses a comparison microscope to compare the toolmarks' "individual characteristics" (for example, microscopic striations within rifling impressions on the known and questioned bullets). The object is to determine whether the individual characteristics are so similar that one and the same tool (for example, a particular gun barrel) must have produced both the test and the evidence toolmarks. Where a crime scene does not yield any gun whose class characteristics match those of the ammunition components recovered from the scene, firearms and toolmark examiners sometimes compare the class and individual characteristics on various ammunition components recovered from the crime scene and/or other crime scenes or the suspect's home or possessions. The object is to determine whether the individual characteristics

are so similar that various ammunition components must all have been fired, or cycled through, the same gun.

8. In 2008, the National Research Council Committee to Assess the Feasibility, Accuracy, and Technical Capability of a National Ballistics Database found that the basic premises of firearms and toolmark identification were not scientifically established. **“Finding: The validity of the fundamental assumptions of uniqueness and reproducibility of firearm-related toolmarks has not yet been fully demonstrated.”** NRC Ballistics Imaging Report, *supra*, at 3, 81. According to the Committee, extensive research would be needed to validate the assumptions.

Additional general research on the uniqueness and reproducibility of firearm-related toolmarks would have to be done if the basic premises of firearms identification are to be put on a more solid scientific footing.

Fully assessing the assumptions underlying firearms identification would require careful attention to statistical experimental design issues, as well as intensive work on the underlying physics, engineering and metallurgy of firearms, but is essential to the long-term viability of this type of forensic evidence.

Id. at 82. See also National Research Committee on Identifying the Needs of the Forensic Science Community, *Strengthening Forensic Science in the United States: A Path Forward* (Prepublication Copy 2009) (“NRC Forensic Science Report”) at 5-20 to 5-21 (quoting the NRC Ballistics Imaging Report’s findings). These negative conclusions about the underlying premises of firearms and toolmark identification are particularly worthy of note because the National Research Council is the operating agency of the National Academy of Sciences, an independent body of distinguished scientists that Congress established in 1863 for the purpose of advising federal government agencies on scientific and technical questions. See NRC Ballistics Imaging Report, *supra*, at iii;

NRC, *Welcome to the National Research Council*,

<http://sites.nationalacademies.org/nrc/index.htm>; National Academy of Sciences, *About the NAS*, http://www.nasonline.org/site/PageServer?pagename=ABOUT_main_page.

NRC committees are staffed by top scientists and professionals who work on a voluntary basis. See NRC, *Welcome to the National Research Council*, *supra*.

The appointment process is designed to ensure that committee members have an “appropriate range of expertise for the task” and bring “a balance of perspectives” to a project. See *Committee Appointment Process*,

http://www8.nationalacademies.org/cp/information.aspx?key=Committee_Appointment:

NRC Ballistics Imaging Report, *supra*, at iii. See also Tr., *United States v. Damian Brown et al.*, 05 Cr. 538 at 13 (S.D.N.Y. June 9, 2008) (statement by Judge Rakoff that “[t]wice in that report in bold face so that no one can miss it, the authors of the report who appear to include quite a few notable scientists as well as others, state, ‘Finding: The validity of the fundamental assumptions of uniqueness and reproducibility of firearms-related toolmarks has not yet been fully demonstrated.’ So, that goes to the most basic premise before we get into anything else, the most basic premise on which this, what you [the Assistant United States Attorney] call ballistic science is premised, yes?”).

9. It is crucial to recognize that even if the necessary research were done to show that guns produce unique and reproducible toolmarks,² this would not suffice to set firearms and toolmark identification on firm scientific foundations. Even assuming *arguendo* that the toolmarks produced by firearms are reproducible and unique, firearms and toolmarks examiners have no reliable *method* for determining whether the

² As explained below in para.12, firearms and toolmark examiners themselves concede that some guns and tools are *not* capable of producing unique toolmarks when they leave the assemblyline.

similarities between toolmarks are so great that they must have been produced by the same gun. According to the National Research Committee on Identifying the Needs of the Forensic Science Community, "A fundamental problem with toolmark and firearms analysis is the lack of a precisely defined process [for reaching identifications]." NRC Forensic Science Report, *supra*, at 5-21. "[T]he decision of the toolmark examiner remains a subjective decision based on unarticulated standards and no statistical foundation for estimation of error rates." *Id.* at 5-20. Similar criticisms of the method that firearms and toolmark examiners use for reaching identification conclusions are advanced in the NRC Ballistics Imaging Report. *Supra*, at 82 ("*Conclusions drawn in firearms identification should not be made to imply the presence of a firm statistical basis when none has been demonstrated.*"); *id.* (criticizing firearms and toolmark examiners' absolute identification conclusions for "cloak[ing] an inherently subjective assessment of a match with an extreme probability statement that has no firm grounding and unrealistically implies an error rate of zero"). *See also* "). *See also Melendez-Diaz v. Massachusetts*, 557 U.S. ___, 2009 WL 1789468 (U.S. Mass.) (June 25, 2009) at * 9 (citing the NRC Forensic Science Report's discussion of "problems of subjectivity, bias, and unreliability of common forensic tests such as latent fingerprint analysis, pattern/impression analysis, and toolmark and firearms analysis"); *United States v. Green*, 405 F. Supp. 2d 104, 110 (D. Mass. 2005) (reasoning that "even assuming that some of these marks are unique to the gun in question, the issue is their significance, how the examiner can distinguish one from another, which to discount and which to focus on, how qualified he is to do so, and how reliable his examination is"); *United States v. Monteiro*, 407 F. Supp. 2d 351, 366 (D.Mass. 2006) ("The question of whether the

methodology of identifying a match between a particular cartridge case and gun is reliable requires far more analysis [than the question of whether cartridge case toolmarks are unique]”). Cf. NRC Forensic Science Report, *supra*, at 5-13 (“Uniqueness and persistence [of each person’s fingerprints] are necessary conditions for friction ridge identification to be feasible, but these conditions do not imply that anyone can reliably discern whether or not two friction ridge impressions were made by the same person.”).

10. The distinctions among various “classes” of toolmarks are key to understanding why firearms and toolmark examiners’ method for reaching identification conclusions is unreliable. Toolmarks are either “striated” toolmarks which consist of patterns of scratches or striae produced by the parallel motion of tools against objects (e.g., the marks gun barrels produce on bullets), or “impression” toolmarks produced on objects by the perpendicular, pressurized impact of tools (e.g., firing pin impressions or breech face marks produced on cartridge cases by the firing pins or breech faces of guns). Both types of toolmarks have class, subclass, and individual characteristics.

11. The distinctively designed features of tools are reflected in the class characteristics of the toolmarks produced by all tools of a certain type. For example, the rifling impressions on bullets are class characteristics reflecting the number, width and direction of twist of the lands and grooves in the types of barrels that fired them. By contrast to class characteristics, microscopic individual characteristics (e.g., the striations or lines within rifling impressions) are what are purported to be unique to the toolmarks each individual tool produces and to correspond to random imperfections or irregularities on tool surfaces produced by the manufacturing process and/or subsequent use, wear,