FOR PUBLICATION

UNITED STATES DISTRICT COURT
DISTRICT OF NEW JERSEY

UNITED STATES OF AMERICA, Plaintiff, v. NELSON OTERO and MAXCIME CAGAN, Defendants.	:	**Criminal No. 11-23 (SRC)** **OPINION**

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CHESLER, District Judge

This matter comes before the Court on the separate motions filed by Defendant Nelson Otero and by Defendant Maxcime Cagan (collectively, "Defendants") to preclude the testimony of the expert witness proffered by Plaintiff the United States of America (the "Government") on the subject of firearms and toolmark identification [docket entries 40 & 41]. The Government has opposed the motion. For the reasons that follow, the Court will deny Defendants' motions.

I. BACKGROUND

A. Firearms and Toolmark Identification

The Daubert motions before the Court revolve around the reliability of forensic toolmark examination employed to identify the firearm from which discharged ammunition originated. By way of background, the Court begins with some relevant definitions. The Third Circuit has observed that the general category of forensic identification evidence "serves to 'connect a crime scene object or mark to the one and only source of that object or mark.'" United States v. Ford, 481 F.3d 215, 219 n.5 (3d Cir. 2007) (quoting Michael J. Saks, Banishing Ipse Dixit: The Impact of Kumho Tire on Forensic Identification Science, 57 Wash. & Lee L. Rev. 879, 881 (2000)). Forensic toolmark identification is a discipline that is concerned with the matching of a toolmark to the specific tool that made it. Firearm identification is a specialized area of toolmark identification dealing with firearms, which involve a specific category of tools. Richard Grzybowski, et al., Firearm/Toolmark Identification: Passing the Reliability Test Under Federal and State Evidentiary Standards, AFTE Journal, Vol. 35, No. 2, Spring 2003, at 211. "Toolmarks are generated when a hard object (tool) comes into contact with a relatively softer

object." National Research Council, Strengthening Forensic Science in the United States: A Path Forward, at 150 (National Academies Press 2009). Toolmarks associated with a firearm may occur in the commission of a crime when "the internal parts of a firearm make contact with the brass and lead [or other materials] that comprise ammunition." Id. "The manufacture and use of firearms produces an extensive set of specialized toolmarks." Id. at 150-51.

Toolmark identification is based on the theory that tools used in the manufacture of a firearm leave distinct marks on various firearm components, such as the barrel, breech face or firing pin. The theory further posits that the marks are individualized to a particular firearm through changes the tool undergoes each time it cuts and scrapes metal to create an item in the production of the weapon. Toolmark identification thus rests on the premise that any two manufactured products, even those produced consecutively off the same production line, will bear microscopically different marks. With regard to firearms, these toolmarks are transferred to the surface of a bullet or shell casing in the process of firearm discharge. Depending on the tool and the type of impact it makes on the bullet or casing, these surface marks consist of either contour scratch lines, known as striations (or striae), or impressions. For example, rifling (spiraled indentations) inside of a gun barrel will leave raised and depressed striae, known as lands and grooves, on the bullet as it is fired from the weapon, whereas the striking of the firing pin against the base of the cartridge, which initiates discharge of the ammunition, will leave an impression but not striae.

Comparing a test bullet or cartridge fired from a firearm of known origin to another bullet or cartridge of unknown origin, the examiner seeks to determine congruence in the pattern of marks left on the examined specimens. This process is known as "pattern matching." When the

marks consist of striations, the identification process can involve a method that observes and counts consecutively matching striae ("CMS").[1] An examiner observes three types of characteristics on spent bullets or cartridges: class, subclass and individual. Class characteristics are gross features common to most if not all bullets and cartridge cases fired from a type of firearm, for example, the caliber and the number of lands and grooves on a bullet. Individual characteristics are microscopic markings produced in the manufacturing process by the random imperfections of tool surfaces (the constantly changing tool as described above) and by use of and/or damage to the gun post-manufacture. According to the theory of toolmark identification espoused by the Association of Firearms and Toolmark Examiners ("AFTE"), individual characteristics "are unique to that tool and distinguish it from all other tools." Theory of Identification as it Relates to Toolmarks, AFTE Journal, Vol. 30, No. 1, Winter 1998, at 87. Subclass characteristics generally fill the gap between the class and individual characteristics categories. They are produced incidental to manufacture but apply only to a subset of the firearms produced, for example, as may occur when a batch of barrels is formed by the same irregular tool.

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[1] CMS theory was first proposed by Alfred Biasotti in 1959, with criteria for CMS identification later introduced in 1997. See Ronald G. Nichols, Firearm and Toolmark Identification Criteria: A Review of the Literature, Part II, J. Forensic Sci., Vol. 48, No. 2, Mar. 2003, at 1. The literature presented to the Court reflects that the role of CMS theory in firearms identification analysis is somewhat unsettled as to whether it competes with traditional pattern matching or seeks to refine it. Ronald Nichols, a leading member of the firearms examiner community and author of various articles in the field, has stated that pattern matching and CMS are not mutually exclusive, but rather that CMS is an attempt to quantify pattern matching conclusions. See United States v. Diaz, No. CR 05-167 WHA, 2007 WL 485967, at *4 (N.D. Cal. Feb. 12, 2007). Grzybowski's 2003 AFTE Journal article explains that it is a manner in which the observed pattern can be described and stresses that CMS is not different from pattern matching but merely an extension of it. Grzybowski at 215.

B. Proposed Expert Testimony in this Case

In relevant part, the Superseding Indictment in this case charges that on or about May 10, 2010, Defendants used and discharged handguns to rob the Exxon/Tiger Mart located at 1440 Route 23 North in Wayne, New Jersey. The proposed testimony of the Government's expert would give the opinion that spent ammunition recovered from that crime scene was fired from certain specific firearms recovered from Defendants. In particular, based on his comparison of test bullets and shells fired from the recovered firearms to the crime scene bullet and shells, the expert would testify that a discharged 45 caliber bullet and a spent 45 caliber shell casing and a spent 9mm shell casing originated from, respectively, the 45 caliber Fabrinor pistol and the 9mm Glock pistol seized in connection with Defendants' arrest. Defendants move that the testimony be precluded for failure to meet the standard of admissibility under Federal Rule of Evidence 702. They take the position that the firearms and toolmark identification examination conducted by the expert lacks both a sufficient factual basis and established scientific methodology to support the opinion that a discharged bullet or shell was fired from a specific weapon. Defendants' argument, summarized briefly, is that the opinion is not reliable because it is not based on objective standards but rather on the examiner's subjective observations and conclusions.

The Government has produced two expert reports: one prepared in July 2010 by Lieutenant James Ryan of the New Jersey State Police ("NJSP") and another prepared on February 21, 2012 by Stephen Deady, an AFTE-certified firearms and toolmark examiner and retired detective sergeant formerly with the NJSP, based on Deady's own independent

examination.[2] Defendants' motions, as filed, sought to preclude the testimony of Lieutenant Ryan, who had conducted what was at the time the only firearms and toolmark identification examination of the evidence at issue in this case. Subsequently, the Government had a second, independent examination of the firearms evidence conducted by Deady, who has since been identified as the Government's expert.

The Court conducted a Daubert hearing over a period of three days. The Government presented Deady's testimony. The Defendants also called one witness, Adina Schwartz, Ph.D., a professor at John Jay College of Criminal Justice. The parties also submitted various documents into evidence. The Court thereafter accepted supplemental briefing. It has considered the evidence presented at the Daubert hearing as well as the parties' written submissions. The following discussion considers the admissibility of Deady's opinion, to a reasonable degree of professional certainty, on the identification of the subject firearms as the source of evidence recovered from the scene of a charged robbery.[3]

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[2] Deady, in fact, had also conducted a review, i.e, the "peer review," of Lieutenant Ryan's 2010 report and confirmed his positive identifications.

[3] As the Government made clear in its supplemental briefing to the Court, it does not seek to present an opinion that the recovered bullet and shells originated from the respective firearms seized from Defendants "to the exclusion of all other firearms in the world." Rather, the Government's position is that its expert, Deady, should be permitted to give testimony on his firearms identification "to a reasonable degree of certainty."

II. DISCUSSION

A. Legal Standard

The Court bears an obligation to act as a gatekeeper and ensure that expert testimony is both relevant and reliable. Kumho Tire Co., Ltd. v. Carmichael, 526 U.S. 137 (1999); Daubert v. Merrell Dow Pharms., Inc., 509 U.S. 579 (1993). Federal Rule of Evidence 702 sets the standard for admissibility of expert testimony. It provides:

> If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise, if (1) the testimony is based upon sufficient facts or data, (2) the testimony is the product of reliable principles and methods, and (3) the witness has applied the principles and methods reliably to the facts of the case.

Daubert articulated various factors that a district court may use to analyze the reliability of expert testimony. That non-exhaustive list of factors is as follows: (1) whether the particular theory can be and has been tested; (2) whether the theory has been subjected to peer review and publication; (3) the known or potential rate of error; (4) the existence and maintenance of standards controlling the technique's operation; and (5) whether the technique has achieved general acceptance in the relevant scientific or expert community. Daubert, 509 U.S. at 593-94. Later, in Kumho Tire, the Supreme Court held that the Daubert analysis applies to all expert testimony, not only to scientific expert testimony, but made clear that "the test of reliability is flexible, and *Daubert's* list of specific factors neither necessarily nor exclusively applies to all experts or in every case." Kumho Tire, 526 U.S. at 141.

B. Defendants Challenge Expert Testimony As Lacking Scientific Basis

Defendants, as the Court indicated above, challenge the admissibility of the firearms identification opinion insofar as it asserts that a particular discharged bullet or spent shell was fired from a particular gun, to the exclusion of all other guns. This individualized identification, Defendants argue, is based on a theory – that is, that firearms-related toolmarks are unique and reproducible – that has not been proven scientifically. In support of this argument, Defendants point to discussions in the 2009 National Research Council's report entitled Strengthening Forensic Science in the United States: A Path Forward (the "NRC Forensic Science Report") and its 2008 Ballistics Imaging Report, each of which called into question the validity of the assumptions about toolmarks that underlie firearms identification. The NRC Forensic Science Report focused on the challenges and limitations faced by a number of forensic science disciplines, including autopsies and medical examinations, DNA analysis, controlled substance analysis, toolmark and firearms identification and many others. It identified deficiencies in the forensic sciences and concluded that generally, the forensic identification disciplines, other than nuclear DNA analysis, lack sufficient grounding in scientific research to verify the accuracy and validity of their methodologies. National Research Council, Strengthening Forensic Science in the United States: A Path Forward, at 12-13, 87. The Ballistics Imaging Report expressly focused on assessing the feasibility and accuracy of a national ballistics database. According to the report itself, its scope did not include any commentary on the discipline of firearms identification or opinion "on the admissibility of firearms-related toolmark evidence in legal proceedings." (Gov't Ex. 15 at 3.)

Defendants also rely heavily on Professor Schwartz's testimony to discredit the theory of forensic firearms and toolmark identification. In Professor Schwartz's opinion, the discipline is hampered by systemic scientific problems, such as inadequate statistical empirical foundations and a lack of objective standards for identification. She believes that these problems should preclude the admission of all expert testimony regarding firearms and toolmark identification as inherently unreliable. The Court, for reasons it will discuss below, finds her testimony unpersuasive, and indeed, of little weight on the question of the reliability of the proffered expert opinion of the Government's witness.

In any event, Defendants criticize the theory and methodology of toolmark identification as, essentially, amounting to pseudo-science at best. Kumho Tire, however, instructs that the reliability of expert testimony does not turn on the grounding of the expert's opinion in scientific principles. Rather, the Supreme Court stressed that a district court has "considerable leeway in deciding in a particular case how to go about determining whether particular expert testimony is reliable." Kumho Tire, 526 U.S. at 152. Moreover, Kumho Tire makes clear that expert testimony on matters of a technical nature or related to specialized knowledge, albeit not scientific, can be admissible under Rule 702, so long as the testimony satisfies the Court's test of reliability and the requirement of relevance. Id. at 149; see also United States v. Mitchell, 365 F.3d at 234 (holding that "*Kumho Tire* extended *Daubert's* 'general principles' to all of 'the expert matters described in Rule 702'" and applying those principles to determine the admissibility of expert testimony on fingerprint identification). This Court expresses no opinion on whether the practice of firearms and toolmark identification constitutes a "scientific" discipline because that is not the question before the Court. Rather, the Court must consider

whether the Government's proffered expert opinion is reliable according to the principles of Kumho Tire. Thus, this Court will proceed to analyze the reliability of Deady's proposed opinion based on the applicable Daubert factors.[4]

C. Application of Daubert Factors

1. Whether the Theory Can be or Has Been Tested

Deady testified that he employs the theory of toolmark identification adopted by AFTE, the leading international organization for firearms and toolmark examiners. The AFTE theory of toolmark comparison permits an examiner to conclude that two bullets or two cartridges are of common origin, that is, were fired from the same gun, when the microscopic surface contours of their toolmarks are in "sufficient agreement." The AFTE theory defines the "sufficient agreement" standard as follows:

> 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 it 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 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.

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[4] The Court notes that Defendants have not challenged Deady's qualifications as an expert in the field of firearms and toolmark identification, nor have they argued that his proposed testimony would not be relevant.

Grzybowski at 212 (quoting Theory of Identification, Range of Striae Comparison Reports and Modified Glossary Definitions - An AFTE Criteria for Identification Committee Report, AFTE Journal, Vol. 24, No. 3, 1992, at 337) (emphasis added). The theory acknowledges that there is a subjective component to the determination of "sufficient agreement," which must necessarily be based on the examiner's training and experience.

As to this factor in the Daubert analysis, the Court holds that the Government has demonstrated that the AFTE theory is testable and has been tested. Studies have been conducted to test the validity of the theory. The literature shows that the many studies demonstrating the uniqueness and reproducibility of firearms toolmarks have been conducted. See, e.g., Ronald G. Nichols, Firearms and Toolmark Identification Criteria: A Review of the Literature, J. Forensic Sci., Vol. 42, No. 3, 1997, at 466; Ronald G. Nichols, Firearm and Toolmark Identification Criteria: A Review of the Literature, Part II, J. Forensic Sci., Vol. 48, No. 2, 2003, at 1; Grzybowski at 213.

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. For example, the Government provided a study of Consecutively Manufactured Ruger P-89 slides. Amy C. Coody, Consecutively Manufactured Ruger P-89 Slides, AFTE Journal, Vol. 35, No. 2, Spring 2003, at 157 (the "Coody study"). The Coody study sought "to confirm that breechface marks on cartridge cases fired from consecutively manufactured slides are distinguishable and identifiable based on individual characteristics present on the breechface of each slide." Id. It concluded that despite the similar characteristics of the ten Ruger P-89 slides employed, a

comparison of fired cartridges of known and unknown origin resulted in positive identification of the cartridge cases to their respective slides. Id. Other studies have examined consecutively manufactured barrels. See, e.g., David J. Brundage, The Identification of Consecutively Rifled Gun Barrels, AFTE Journal, Vol. 30, No. 3, Summer 1998, at 438.

The Government has also cited validation studies that focus on determining whether distinguishing toolmarks made by firearms are reproducible, such that over time the marks continue to be individualized to a particular firearm. For example, one such study fired 501 rounds of one type of ammunition from one 25 caliber Raven Arms pistol, selected based on its relatively inexpensive manufacture and cost and thus popularity among criminals. Robert J. Shem, Comparison of 501 Consecutively Fired Bullets and Cartridge Cases From a 25 Caliber Raven Pistol, AFTE Journal, Vol. 15, No. 3 (the "Shem study"). The Shem study sought "to determine the longevity of a sufficient number of individual characteristics needed to positively match one bullet and cartridge case to another fired many shots later." Id. at 109 (emphasis in original). It concluded that as to bullets, sufficient individual characteristics persisted to permit a positive identification, although it did recognize that these tend to erode with each successively fired bullet. As to cartridges, it concluded that individual characteristics on the breechface markings remained unchanged. Id. at 110. Other studies cited and supplied by the Government regarding validation of the underpinnings of toolmark identification theory are Shane J. Kirby, Comparison of 900 Consecutively Fired Bullets and Cartridge Cases From a 455 Caliber S&W Revolver, AFTE Journal, Vol. 15, No. 3 and Erich D. Smith's Cartridge Case and Bullet Comparison Study with Firearms Submitted in Casework, AFTE Journal, Vol. 36, No. 4.

Deady, who himself has participated in two validity studies, explained in his testimony how those studies were designed. They used a set of shells and bullets discharged from ten consecutively manufactured barrels of the same make, which through such similarity represent the best known non-match for the examiner to use in comparing fired ammunition. They tasked participating firearms and toolmark examiners with matching the test components, whose origin is known to a certainty, to a set of bullets and shells of unknown origin.

Pursuant to the AFTE theory of identification, when an examiner concludes that a particular, individual firearm's toolmarks have produced the markings on an examined bullet or shell, he or she "is basing this opinion on the fact that the nature of toolmark agreement, whether impressed or striated, exceeds the best known non-matching agreement that has ever been personally observed, seen in the literature, or discussed with other examiners." Grzybowski at 213. Though the methodology of comparison and the AFTE "sufficient agreement" standard inherently involves the subjectivity of the examiner's judgment as to matching toolmarks, the AFTE theory is testable on the basis of achieving consistent and accurate results. Id. The literature in the field of firearms and toolmark identification documents that the theory has been repeatedly tested. Industry standard, moreover, dictates that one examiner's findings must be reviewed by another examiner to confirm, or possibly disagree, with those findings. Deady testified that this process is known as "peer review."

The literature, together with Deady's first-hand account of participating in validity studies and the peer review process of confirming identifications, demonstrate that the AFTE firearms and toolmark identification theory is testable and has been tested.

2. Peer Review and Publication of AFTE Theory

AFTE theory is subject to peer review through submission to and publication by the AFTE Journal of validation studies which test the theory. The AFTE Journal publishes articles, studies and reports concerning firearm and toolmark evidence. It has a formal process for the submission of articles, including "specific instructions for writing and submitting manuscripts, assignment of manuscripts to other experts within the scientific community for a technical review, returning of manuscripts to authors for clarification or re-write, and a final review by the Editorial Committee." Grzybowski at 220. There is also a formal post-publication peer review process, allowing AFTE members and any other interested individuals to comment on previously published articles. The validation studies discussed above in Section 1, which the Government has submitted to demonstrate the testability and viability of AFTE identification theory, were published in the AFTE Journal. The Court thus concludes that the Government has presented evidence in support of this factor.

3. Known or Potential Rate of Error

The Government submitted three studies concerning the error rate among trained firearms and toolmark examiners.[5] Commenting on other researchers' analyses of data supplied by the Collaborative Testing Service ("CTS") on international proficiency testing in the firearm and toolmark identification discipline, Grzybowski's 2003 AFTE Journal article summarized error rate calculations derived from the CTS proficiency testing results. He reported that CTS data for the period 1978 to 1997 (firearms) and 1981 to 1997 (toolmarks) demonstrated that false-identification error rates were 0.9% for firearms and 1.5% for toolmarks, and for the period

[5] See Smith, Brundage and Grzybowski, supra.

1998 to 2002, were 1.0% for firearms and 1.2% for toolmarks. Grzybowski at 217. These percentages, he noted, do not include false eliminations or an examiner's determination of "inconclusive." Grzybowski's article also points out that there are other limitations to using the proficiency testing data to calculate an error rate, such as the inherent motivation in such a test for the examiner, whose proficiency is being evaluated, to tend toward conservative results and the lack of peer review or other quality control measure applied to such examinations.

The Court nevertheless finds that, while a definitive error rate has not been calculated, the information derived from the proficiency testing is indicative of a low error rate. 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 purposes of utilizing toolmark identification in legal proceedings, the critical validation analysis has to be the extent to which false positives occur. Virtually by definition, any situation in which the examiner concludes that the comparison is inconclusive means that the examination will have no probative value and will thus not be considered by the trier of fact.

The error rate reported by the Grzybowski article is, moreover, consistent with Deady's testimony that based on his knowledge of validation studies published in the AFTE Journal and his own experience in such studies, the error rate hovered around 1 to 2 %. In short, the evidence presented shows that error rates for false identifications made by trained examiners is low. Accordingly, this Daubert factor also weighs in favor of admitting the challenged expert testimony.

4. Existence and Maintenance of Standards Controlling the Technique's Operation

As discussed above, the AFTE standard of "sufficient agreement" is the established standard controlling firearms and toolmark identification. The New Jersey State Police ("NJSP") Laboratory, under the purview of which Deady conducted the examination of the evidence involved in this case, maintains a Firearms and Toolmarks Procedures Manual (the "Manual") which follows the AFTE standard. It provides that "[a] sufficient correspondence of individual characteristics will lead the examiner to conclude that both items (evidence and tests) originated from the same source (Positive)." (Def. Ex. O at 80.) The Manual details procedures for the analysis of evidence bullets and shells for comparison with test specimens utilizing a comparison microscope, which "allows the examiner to place the evidence and a test standard simultaneously on a microscope for comparison purposes." (Id. at 78.) Among other steps it outlines, the Manual requires the examiner to compare test-fired components against each other first under the comparison microscope to establish reproducibility of class and individual characteristics. The examiner may then proceed to compare the discharged evidence in question to a test fired shot known to have originated from a particular firearm. The Manual requires that the entire evidence surface be considered. The Manual also provides for a peer review of each examination to be conducted by another firearms examiner to ensure the integrity of the examination process and accurate results.

Deady testified that he followed all NJSP laboratory procedures in conducting the subject examinations. He documented his observations and findings with detailed notes and explanations in his report, which not only gave his conclusions as to a positive match but also

stated the reasons for that conclusion. For example, the report states that Deady's comparison of the test 9 mm shells he fired with the evidence 9 mm shell results in a positive identification of the origin weapon because he found pattern matching according to the CMS method as to breechface marks, firing pin drag and firing pin aperture shearing and a match as to the firing pin impression (where CMS is not applicable). Deady also took a number of photographs, known as photomicrographs, of the side-by-side microscopic images of the evidence and test specimens as compared for agreement regarding various types of toolmarks, such as striations made by impact of the cartridge against the breech face of the 9 mm's firing chamber and impressions left by the firing pin. Additionally, Deady's report, and his testimony, reflect that the peer review procedure was followed in his examination.

In sum, the Court concludes that the maintenance of industry-compliant standards by the NJSP for conducting a firearms and toolmark identification examination, and the adherence to those standards and procedures by Deady in this case, further support the reliability and therefore admissibility of the expert testimony.

5. General Acceptance of the Theory

Courts have observed that the AFTE theory of firearms and toolmark identification is widely accepted in the forensic community and, specifically, in the community of firearm and toolmark examiners. See United States v. Diaz, No. CR 05-167 WHA, 2007 WL 485967, at *11 (N.D. Cal. Feb. 12, 2007). Even courts which have criticized the bases and standards of toolmark identification have nevertheless concluded that AFTE theory and its identification methodology is widely accepted among examiners as reliable and have held the expert identification evidence to be admissible, albeit with limitations. United States v. Taylor, 663 F.

Supp. 2d 1170, 1178 (D. N.M. 2009); United States v. Monteiro, 407 F. Supp. 2d 351, 372 (D. Mass. 2006); United States v. Green, 405 F. Supp. 2d 104, 122-24 (D. Mass 2005).

This Court also concludes that the evidence submitted by the Government demonstrates the general acceptance of the AFTE theory among professional examiners as a reliable method of firearms and toolmark identification.

D. Testimony of Adina Schwartz, Ph.D.

The Court has considered the views offered by Professor Schwartz on the admissibility of evidence in this forensic field, and it is not persuaded that they cast doubt on the reliability of Deady's testimony. To begin with, Professor Schwartz's academic background does not appear to be one that would have prepared her to analyze the reliability of toolmark identification. Her curriculum vitae indicates that she received a doctorate in philosophy from Rockefeller University, which is an institution dedicated to biomedical research. Professor Schwartz testified that while she undertook some study of the philosophy of science, her degree was awarded for her study of social and political philosophy. Thus, if the issue before the Court were whether or not toolmark identification procedures satisfy scientific standards, her academic background would not appear to give her any particular expertise in whether the discipline adheres to scientific precepts. Moreover, her admitted lack of experience in participating in any firearms identification examination or study concerning firearms-related toolmarks further limits any claim of expertise in the field of firearms and toolmark analysis.

The Court, of course, recognizes that Federal Rule of Evidence 702 permits one to be qualified as an expert through various means, including study of the literature relating to a field. It is clear that Professor Schwartz is indeed conversant with the relevant literature. It is on this

basis only that the Court is willing to consider her expertise in critiquing the field of toolmark identification. In analyzing Professor Schwartz's affidavit and testimony, however, the Court finds it to be troubling that the nature of her presentation suggests that she has analyzed the literature as an advocate for particular position rather than as a dispassionate analyst. Such concern has similarly been voiced by other judges.[6]

Professor Schwartz has made selective citations to studies that simply do not support her opinion. Given that Professor Schwartz's opinion is based solely upon her review of the literature, the Court is particularly concerned with the manner in which she cites to such sources.

For example, at paragraph 61 of her affidavit, Professor Schwartz calls into question the validity of both the methods and standards upon which forensic firearms and toolmarks identifications are based by stating that examiners disagree with each other about identity criteria, about the conclusions to draw in particular cases and even, over time, as to their own conclusions in regard to the same evidence. She cites Erich D. Smith's Cartridge Case and Bullet Comparison Study with Firearms Submitted in Casework, AFTE Journal, Vol. 36, No. 4., Fall

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[6] For example, in State of Florida v. Hilton, Judge James Hankinson heard Professor Schwartz's testimony before he denied the defense's motion to preclude certain toolmark identification testimony by the prosecution's expert. He gave the following assessment of her presentation in his 2011 opinion: "Dr. Schwartz is certainly knowledgeable of literature in the field. However, the Court finds that she is a biased witness attempting to advocate a cause rather than an objective witness." (Gov't Ex. 7 at ¶ 4.) In United States v. Taylor, the United States District Court for the District of New Mexico granted the Government's motion to exclude Professor Schwartz's expert testimony, finding, among other things, that she lacked qualifications to critique the findings of the government's firearms examiner and that her testimony was not reliable under Rule 702. See United States v. Taylor, No. CR 07-1244 WJ (D. N.M. Sept. 30, 2009). (Gov't Ex. 8.) In that case, following a Daubert hearing in which the court heard Professor Schwartz's testimony, Judge William Johnson issued an opinion that pointed out "serious criticisms, not just of Dr. Schwartz's conclusions, but of the integrity of her scholarship." (Id. at 13.)

2004 at 130 (the "Smith study"). As the Government pointed out in its cross-examination of Professor Schwartz, the Smith study did not reach this conclusion. Rather, a review of the article reveals that it reported on a validation study which examined variables that generated the microscopic features on barrels and breech faces over time. It selected Ruger P89 pistols that had similar class characteristics but also that had been in circulation in the general population where they were exposed to the environment and abuse. Each test packet provided to an examiner contained one true identification and 44 true eliminations for both cartridge cases and bullets. Contrary to Professor Schwartz's statement regarding disagreement among examiners, the Smith study actually concluded as follows: "The majority of participants were able to determine the true identifications amongst the overwhelming number of true eliminations. The results indicate that the participants' comparisons were precise, using pattern recognition to determine a common source." Id. at 132.

Another example appears in her 2005 article published in The Columbia Science and Technology Law Review. In that article, entitled A Systemic Challenge to the Reliability and Admission of Firearms and Toolmark Identification, Professor Schwartz discusses the possibility of incorrect identifications as a result confusing subclass with individual characteristics and thus identifying the wrong tool as the source of a mark. See Adina Schwartz, A Systemic Challenge to the Reliability and Admission of Firearms and Toolmark Identification, 6 Colum. Sci. & Tech. L. Rev. 2 (2005). Professor Schwartz quotes a study published in the AFTE Journal as explaining that "'[a]s tool manufacturers minimize the steps necessary to produce tools in an effort to become more efficient and economical, the possibility for tools produced with similar characteristics increases.'" (Gov't Ex. 20 at 11, quoting Stephanie J. Eckerman, A Study of

Consecutively Manufactured Chisels, AFTE Journal, Vol. 34, No. 4, Fall 2002, at 380 (the "Eckerman study").) The AFTE article from which she quotes, however, makes no such finding. In fact, on cross-examination, the Government elicited from Professor Schwartz her recognition that she had quoted the study's ultimately unproven hypothesis as its conclusion. The Eckerman study actually makes the following observation: "The findings of this research indeed support the results of the scientists in earlier studies: consecutively finished tools do not produce toolmarks with matching features. The nature of this particular manufacturing process affords unique and individual characteristics to the tools made." Eckerman at 389. Thus, while the Eckerman study's findings tend to disprove the hypothesis, these findings are not even mentioned in Professor Schwartz's article.

Professor Schwartz admitted during the Daubert hearing that she does not regard herself as a neutral scholar on the topic of forensic firearms and toolmark identifications but rather as an advocate. Cross-examined about testimony given previously in another matter, she also admitted that she takes the position that she has a moral responsibility to prevent the admission of firearms-related toolmark identification evidence. The examination confirmed this as follows:

> Q. Okay. And the question posed to you, do you see it, is, "But you don't believe you're an advocate for this cause?" Do you see that's the question?
>
> A. Let's see. That's correct.
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> Q. And then the answer, I'm just going to read it and please follow along, "I believe that there are no scientific foundations for firearms and toolmark identification and that, therefore, this should not be a basis for convicting anyone, and I believe I have a moral, if you like, responsibility to contribute to people not being convicted on the basis of pseudo expertise in this area. If that

makes me an advocate, I'm an advocate." Do you recall this testimony?

A. I recall this testimony and I agree with that position. That is my position.

(Tr., 2/24/12, at 21:11-25.)

In light of the foregoing, the Court concludes that Professor Schwartz's opinions are substantially outweighed by the evidence supporting admissibility.

E. Conclusion Regarding Admissibility of Firearms Identification Testimony

The Court's analysis of the proposed testimony according to the Daubert factors leads it to conclude that Deady's expert report and opinion are admissible under Rule 702. For the reasons discussed above, the Court concludes that the Government has demonstrated that Deady's proffered opinion is based on a reliable methodology. The Court recognizes, as did the National Research Council in Strengthening Forensic Science in the United States: A Path Forward, that the toolmark identification procedures discussed in this Opinion do indeed involve some degree of subjective analysis and reliance upon the expertise and experience of the examiner. The Court further recognizes, as did the National Research Council's report, that claims for absolute certainty as to identifications made by practitioners in this area may well be somewhat overblown. The role of this Court, however, is much more limited than determining whether or not the procedures utilized are sufficient to satisfy scientists that the expert opinions are virtually infallible. If that were the requirement, experience-based expert testimony in numerous technical areas would be barred. Such an approach would contravene well-settled precedent on the district court's role in evaluating the admissibility of expert testimony. The

Third Circuit has cautioned against imposing overly exacting standards on what constitutes admissible testimony under Rule 702. See Pineda v. Ford Motor Co., 520 F.3d 237, 244, 248 (3d Cir. 2008). It has stressed that the district court must conduct a flexible reliability analysis and leave questions about the strength of evidence to the jury. Id. at 248-49; see also Thomas & Betts Corp. v. Richards Mfg. Co., 342 F. App'x 754, 760-61 (3d Cir. 2009) (reversing district court's decision to bar an expert's testimony, reasoning that the court applied more demanding standard than required under Rule 702).

Moreover, though the parties have not argued it, the relevance of such testimony to the charges against Defendants is manifest. Clearly, the evidence will assist the trier of fact to determine a fact in issue, that is, Defendants' alleged involvement in the May 10, 2010 armed robbery at the Exxon/Tiger Mart in Wayne, New Jersey.

Thus, both essential foundations for the admission of expert testimony under Rule 702 – relevance and reliability – have been established by the Government. Accordingly, Defendants' motion to preclude Deady's testimony will be denied.

s/Stanley R. Chesler
STANLEY R. CHESLER
United States District Judge

Dated: March 15, 2012