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IN THE SUPERIOR COURT OF THE STATE OF WASHINGTON
IN AND FOR THE COUNTY OF KITSAP

STATE OF WASHINGTON,

Plaintiff,

vs.

GERALDO DeJESUS,

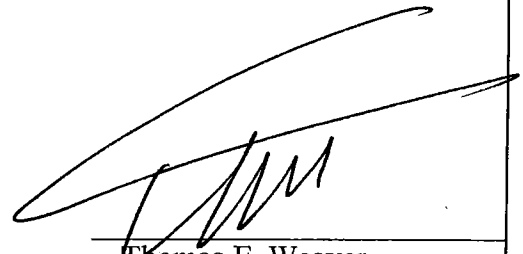
Defendant.

) Case No.: 15-1-00972-7

) MOTION TO SUPPRESS RE: FRYE

COMES NOW the Defendant, Geraldo DeJesus, by and through his attorney, Thomas E. Weaver, and moves pursuant to CrR 3.6, ER 702, the Fifth, Sixth, and Fourteenth Amendments, and Frye v. United States, 54 App. D.C. 46,293 F. 1013 (1923) for an order precluding any State's witness from testifying about toolmark/ballistics identification. This motion is supported by the attached Memorandum of Law.

Dated this 19th day of February, 2016.



Thomas E. Weaver
WSBA #22488
Attorney for Defendant

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IN THE SUPERIOR COURT OF THE STATE OF WASHINGTON
IN AND FOR THE COUNTY OF KITSAP

STATE OF WASHINGTON,

Plaintiff,

vs.

GERALDO DeJESUS,

Defendant.

) Case No.: 15-1-00972-7

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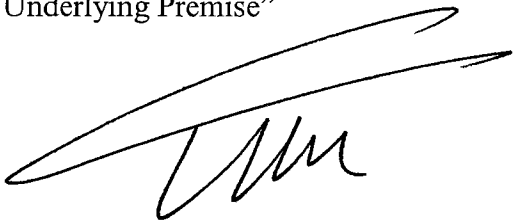
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- Appendix A – Affidavit of William Tobin
- Appendix B – Affidavit of Clifford Spielgelman
- Appendix C – CV of William Tobin
- Appendix D – Interview of Kathy Geil in State v. Marshall
- Appendix E – Recommendation of the National Commission of Forensic Science to Attorney General
- Appendix F – Williams v. United States (Judge Easterly, concurring)
- Appendix G – Hypothesis Testing of the Critical Underlying Premise”

Dated this 18th day of February, 2016.



Thomas E. Weaver
WSBA #22488
Attorney for Defendant

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IN THE SUPERIOR COURT OF THE STATE OF WASHINGTON
IN AND FOR THE COUNTY OF KITSAP

STATE OF WASHINGTON,	}	Case No: 15-1-00972-7
Plaintiff,	}	MEMORANDUM OF LAW IN SUPPORT OF <i>FRYE</i> MOTION
vs.	}	
GERALDO DeJESUS,	}	
Defendant.	}	

COMES NOW the Defendant, GERALDO DeJESUS, by and through his attorney, Thomas E. Weaver, and makes the following arguments in favor of his motion to suppress expert testimony regarding ballistics/tool marking identification¹ (hereinafter “ballistics identification”).

A. Issues Presented

1. Is ballistics identification evidence is generally accepted in the scientific community?

¹ The sources cited in this brief refer to this area of forensic science by various names. Regardless of what name is used, this Brief addresses the attempt by forensic scientists to match tools, firearms, bullets, and shell casings by the allegedly unique markings left by the implement. As specifically applied to Mr. DeJesus’ case, it refers to the attempt to match the ten shell casings left at the crime scene with NMS-08.

- 1 2. Are the techniques currently employed in the area of ballistic
2 identification capable of producing reliable results?
3
4 3. Will ballistic identification testimony help the jury to understand
5 the evidence or to determine a fact in issue pursuant to ER 702.
6
7

8 B. Statement of Facts

9 On March 28, 2015, someone entered a residence in the Kariotis Mobile
10 Home Park with a firearm and fired ten bullets. As a result, ten shell casings were
11 left at the scene and later collected as evidence. Heather Kelso was shot and
12 killed, as was two-year-old KL. KL's mother was present but not hit by any
13 bullets. Matthew Dean was also present and was shot, but not killed.
14

15 Heather Kelso's estranged boyfriend, Geraldo DeJesus was an immediate
16 person of interest in the assault. Police obtained a search warrant for his
17 residence on March 30, 2015. Inside the residence, they discovered a gun case.
18 Although the gun case did not have a firearm, it did have a spent shell casing,
19 hereinafter referred to as NMS-08. Further investigation revealed that Smith and
20 Wesson includes a spent shell casing with their firearms at the time of sell. Police
21 believe NMS-08 is a test fire shell casing fired at the time of manufacture by the
22 manufacturer, Smith and Wesson.

23 The eleven shell casings (ten from the crime scene and NMS-08) were all
24 sent to the WSP Crime lab and were analyzed by Kathy Geil. Ms. Geil
25 conclusion is that all eleven shells casings were fired from the same firearm.

1 Mr. Geil submitted to a defense interview in 2015 about ballistic
2 identification in a King County case, State v. Marshall. See Appendix D. In
3 response to questions from the defense, she admitted that ballistic identification is
4 different from other forms of forensic identification techniques, such as DNA.
5 Appendix D, Pg.13. When she is asked to make an identification, she comes to
6 one of four results: identify, eliminate, inconclusive, or not suitable for
7 identification. Page 8. In reaching her conclusions, she does not rely on any
8 statistical analysis; instead, she relies on "practical certainty." Pg. 7-8. This is
9 true because there is no way to calculate the "probability" that two firearms would
10 produce "similar [tool] markings." Pg. 13. Despite the fact that she has no
11 statistical or empirical data to back up her conclusions, in any case where she has
12 reached a conclusion of "identify," she is "100 percent confident" in her
13 conclusions. Pg.14.

15 The defense has hired two expert witnesses. The first expert is William
16 Tobin. Mr. Tobin is a metallurgy expert who has been qualified as an expert
17 witness in 45 states and testified in 262 trials. He holds a master's degree in
18 metallurgy. Mr. Tobin worked for the FBI Laboratory from 1971 until he retired
19 in 1998, primarily working in their metallurgy department. For twelve of those
20 years, from 1986 to 1998, he was the *de facto* Chief Forensic Metallurgist at the
21 FBI.

22 Dr. Clifford Spiegelman is a forensic statistician. He has a Ph.D. in
23 Statistics/Applied Mathematics. He is currently holds the seat of Distinguished
24 Professor at Texas A&M University. He has worked in the field of forensic
25 statistics for over 40 years.

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Attached to this memorandum are affidavits from Mr. Tobin and Dr. Spiegelman. Both experts reach the same conclusion: ballistics identification is not based upon verifiable scientific criteria. The opinions of ballistics identification experts are based upon subjective opinions, and not objectively tested hypotheses. Ballistics identification is, to put it bluntly, junk science; or, as one judge recently put it, no more reliable than the “the vision of a psychic.” *Williams, infra*, at 26. See Appendix F.

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C. Argument

The scientific field of ballistic identification has experienced significant criticism in recent years. Like other areas of forensic science, forensic scientists and legal practitioners are constantly reviewing procedures, protocols, and controlled studies to improve the accuracy and reliability of the information that is provided to juries. Just last week, one influential board recommended the immediate discontinuation of related forensic science of bite mark identification evidence, despite its widespread use for over fifty years.² Similarly, ballistic identification is also receiving significant criticism. The use of unreliable forensic science creates a high risk of false convictions and needs to be rethought. Ballistics identification is such a forensic science and Mr. DeJesus' motion to preclude testimony on ballistic identification should be granted.

The first modern case to question the use of ballistics identification evidence was *United States v. Green*, 405 F.Supp. 104 (D. Mass. 2005). The Court said, "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* at 107. Other courts have also cautioned against the use of ballistics identification evidence. *United States v. Diaz*, 2007 WL 485967 (N.D. Cal. 2007); *United States v. Williams*, 506 F.3d 151 (2nd Cir. 2007); *United States v. Cazares*, 788 F.3d 956, 989 (9th Cir. 2015). I

² <http://www.reuters.com/article/texas-bitemark-idUSL2N15R00N>

1 In 2008, the National Research Council's published a seminal report,
2 *Ballistics Imaging*.³ The report "determined that there was no data-based
3 foundation to declare, with any certainty, individualization based on toolmark
4 pattern matching."

5 In her concurrence in a recent case from the District of Columbia, Judge
6 Easterly was highly critical of ballistic identification testimony. Appendix F.
7 *Williams v. United States*, CF1-18032-10, decided January 21, 2016, (Judge
8 Easterly, concurring). After citing with approval the *Ballistics Imaging* report,
9 Judge Easterley wrote:

10
11 The NRC Committee further expressed concern that, notwithstanding
12 the absence of data and the corresponding statistical unknowns,
13 firearms and toolmark examiners "tend to cast their assessments in
14 bold absolutes, commonly asserting that a match can be made 'to the
15 exclusion of all other firearms in the world.'" *Ballistic Imaging, supra*
16 note 3, at 82. The NRC Committee denounced this sort of testimony,
17 explaining that "[s]uch comments cloak an inherently subjective
18 assessment of a match with an extreme probability statement that has
19 no firm grounding and unrealistically implies an error rate of zero." *Id.*
20 "[S]topping short of commenting on whether firearms toolmark
21 evidence should be admissible" in court, the NRC Committee
22 determined that "[c]onclusions drawn in firearms identification should
23 not be made to imply the presence of a firm statistical basis when none
24 has been demonstrated." *Id.* (emphasis in original).

19 *Williams* at 20-21.

20 After reviewing the relevant scientific treatises, Judge Easterly concludes
21 that it is "alarming" that ballistics experts continue to testify to their "pattern-
22 matching conclusion[s] with absolute certainty." *Williams* at 23. In fact, Judge
23

24
25

³ <http://www.nap.edu/catalog/12162/ballistic-imaging>

1 Easterly concludes, "As matters currently stand, a certainty statement regarding
2 toolmark pattern matching has the same probative value as the vision of a
3 psychic: it reflects nothing more than the individual's foundationless faith in what
4 he believes to be true." *Williams* at 26.

5 Given this criticism in the scientific fields regarding ballistics
6 identification, there is a substantial risk of wrongful conviction were this Court to
7 allow Kathy Geil to testify as to her findings. When determining the admissibility
8 of scientific evidence, Washington continues to follow a modified version of the
9 original *Frye* opinion. *Frye v. United States*, 54 App. D.C. 46,293 F. 1013
10 (1923). The Court of Appeals recently issued an opinion that concisely sets out
11 the applicable law in Washington regarding the admissibility of scientific
12 evidence. *In re Ritter*, 30845-6-III, decided February 4, 2016. In *Ritter* the Court
13 said the following:
14

15 Whether novel scientific evidence is admissible presents a mixed
16 question of law and fact which this court reviews de novo. *In re Det. of*
17 *Pettis*, 188 Wn. App. 198, 20405,352 P.3d 841 (2015) (finding that the
18 SRA-FV satisfies *Frye*). . . Washington applies the *Frye* test to gauge
19 whether expert testimony premised on scientific evidence may be
20 admissible. *State v. Copeland*, 130 Wn.2d 244, 261,922 P.2d 7 1304
21 (1996). *Frye* requires that expert testimony be based on principles
22 generally accepted in the scientific community. *State v. Canaday*, 90
23 Wn.2d 808, 812, 585 P.2d 1185 (1978). The test is two prong: (1)
24 whether the underlying theory is generally accepted in the scientific
25 community, and (2) whether there are techniques utilizing the theory
which are capable of producing reliable results. *State v. Riker*, 123
Wn.2d 351, 359,869 P.2d 43 (1994). The court does not assess the
reliability of the evidence, but if there is significant dispute between
qualified experts as to its validity, it may not be admitted. *Copeland*,
130 Wn.2d at 255. If the scientific principle satisfies *Frye*, the trial
court applies ER 702 in determining whether to admit testimony.
Pettis, 188 Wn. App. at 205. This court reviews the trial court's ER

1 702 ruling for abuse of discretion. *Id.* Discretion is abused if it is
2 exercised on untenable grounds or for untenable reasons. *State ex rei.*
3 *Carroll v. Junker*, 79 Wn.2d 12,26,482 P.2d 775 (1971).

4 In Mr. DeJesus' case, he challenges the State's proposed ballistics
5 testimony on three grounds. First, ballistic identification is not generally accepted
6 in the scientific community. Second there are not techniques for employing
7 ballistic identification which are capable of producing reliable results. Third, the
8 testimony of Ms. Geil will not assist the jury in understanding the evidence.

9
10 1. Ballistics identification evidence is not generally accepted in
11 the scientific community.

12 The affidavits of Mr. Tobin and Dr. Siefferman establish that ballistics
13 identification is not generally accepted in the scientific community. See
14 Appendices A (Tobin) and B (Siefferman). Kathy Geil in her C.V. lists her
15 membership in the Association of Firearm and Toolmarks Examiners (AFTE).
16 The AFTE is a trade association, not a scientific body. Tobin, 9. Although the
17 AFTE attests to the validity of ballistics identification, its members do not
18 agree on the number, type, quality, and characteristics that must match before
19 a source attribution can be claimed. Tobin, 16-17.

20 While the AFTE believes that ballistics identification is possible, the
21 relevant scientific community does not believe the science is sufficiently
22 developed to permit in-court testimony regarding it. Mr. Tobin lists ten
23 forensic scientists (including himself) and multiple scholarly articles that have
24 rejected ballistics identification and are of the opinion that it should not be
25 used in a courtroom setting. Tobin, 12-13.

1 In fact, Mr. Tobin, after an exhaustive search of the scholarship in this
2 area, has been unable to find a single scientific study, *not one*, establishing the
3 uniqueness of firearms and their bullets/shell casings. Tobin, 15. In the 2008
4 seminal report *Ballistics Imaging* (referenced above), the NRC concluded:

5 A significant amount of research would be needed to
6 scientifically determine the degree to which firearms-related
7 toolmarks are unique or even to quantitatively characterize the
probability of uniqueness.

8 Tobin, 16, quoting *Ballistics Imaging* at 3. The lack of studies leads forensic
9 statisticians like Dr. Spiegelman to conclude that ballistics identification is not
10 generally accepted in the scientific community and that this belief is
11 “generally held by highly esteemed scientists, as reflected by recent National
12 Research Council reports.” Spiegelman, paragraph 8.

13 Mr. Tobin makes an interesting observation at page 26 of his Affidavit
14 that efforts to create a national database of firearms and firearm identification
15 has thus far proved ineffective. Unlike DNA and fingerprint databases, which
16 have proliferated around the nation and world and are routinely used to solve
17 “cold cases,” similar with ballistics identification have not worked. As will be
18 discussed below in the discussion on reliability, the most logical explanation
19 for this difference is that while DNA and fingerprint identification is based
20 upon scientifically objective criteria and points of identification, ballistics
21 identification is based upon the subjective beliefs of the examiner, something
22 that is anathema to the precision needed for solving cold cases.

23 This Court should find there is not consensus in the scientific
24 community sufficient to allow expert testimony on ballistics identification.

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2. The techniques currently employed in the area of ballistic identification are not capable of producing reliable results.

The affidavits of Mr. Tobin and Dr. Siefferman establish that ballistics identification does not employ techniques that produce reliable results. As discussed above, there has not been a single study establishing that firearms create individualized characteristics that are unique to each individual firearm. The process of trying to tie a particular piece of metallurgy (e.g. bullets, shell casings) becomes nearly impossible, particular when the firearm in question has not been recovered, as is the case in Mr. DeJesus' case. See Tobin, 8.

The process of ballistic identification is based 100% on the subjective beliefs of the examiner. Tobin, 11. Ms. Geil admitted as much in her 2015 interview when she clarified that, despite the fact she is unable to quantify the margin of error in her findings, she is 100% confident in her findings. A "scientific" opinion that is based upon the subjective beliefs of the examiner rather than scientifically verifiable processes is not reliable.

One of the main problems with relying on the subjective beliefs of the examiner is that there is no way to calculate the error rate. "Properly designed validation studies not only show that an SOP is reliable and accurate, they also estimate *how* accurate." Spiegelman, paragraph 6. Given the current state of the science and the lack of empirical studies, "the error rate for toolmark examinations is unknown. The 'science' behind zero or near-zero error rates claimed by toolmark examiners is not defensible in the scientific community." Spiegelman, paragraph 7. In other words, Ms. Geil's belief in the 100% accuracy of her findings is scientifically indefensible.

1 The AFTE essentially concedes that ballistics identification is a
2 subjective, rather than objective, endeavor. It concedes that the methodology
3 used is devoid of objective criteria. "A fundamental problem with toolmark
4 and firearm analysis is the lack of a precisely defined process. . . AFTE has
5 adopted a theory of identification, but it does not provide a specific protocol."
6 Tobin, 17, quoting NAS Forensic Science Report.

7 The use of subjective, rather than objective, criteria, explains why
8 ballistics identification is fundamentally different from DNA and fingerprint
9 identification. When a DNA analyst looks at a bodily fluid, the analyst is
10 looking at a unique pattern of G-A-T-C units. Although it is hypothetically
11 possible for two people to have the same pattern, it is statistically possible to
12 calculate the chance of such an occurrence. In this case, blood found at the
13 crime scene was found to match the DNA of Matthew Dean. The chance of
14 another person having the same DNA pattern is 1 in 660 quintillion. Similarly,
15 a drop of blood found on a pair of pants belonging to Mr. DeJesus was found
16 to match his DNA. The chance of another person having that same DNA
17 pattern is 1 in 290 quintillion. While numbers of this magnitude may be the
18 functional equivalent of a 100% identification, we are able to statistically
19 quantify the results. Conversely, Ms. Geil refuses to use statistics to quantify
20 her results. See Appendix D, page 8.

21 The problem is even easier to illustrate when one compares fingerprint
22 identification with ballistics identification. In the area of fingerprint
23 identification, forensic scientists disagree on how many points of
24 identification are needed to make a match. Some scientists require as many as
25 20 points, while others are willing to declare a match with as few as 12 points.

1 This scientific debate is healthy and beneficial in the field of fingerprint
2 identification. But regardless of whether a scientist requires 12 points of
3 identification, 20 points of identification, or somewhere in between, all
4 forensic scientists agree that a minimum number of points is required to
5 declare an identification.

6 The converse is true in ballistic identification. As the National
7 Research Council observed, “[W]e are not able to specify how many points of
8 similarity are necessary for a given level of confidence in the result.” Tobin,
9 22, quoting the Ballistics Imaging, 3. Significantly, a ballistics examiner is
10 permitted to make a firearm identification based upon the examiner’s
11 subjective belief about the identification without a single point of
12 identification. The examiner also declines to identify the number of points of
13 identification for comparison by a subsequent examiner. This position is
14 scientifically indefensible and forensically intolerable, as it can only lead to
15 false convictions.

16 The defects identified by the National Research Council are present in
17 Mr. DeJesus’ case. Dr. Spiegelman reviewed the Standard Operating
18 Procedure (SOP) employed by Ms. Geil and found it “woefully lacking”
19 because it fails to include a statement about how far apart toolmarks have to
20 be, measured in fractions of an inch or other units, in order to state that the
21 bullets did not come from the same gun.” Spiegelman, Paragraph 4. Ms. Geil
22 concludes that the ten shell casings found at the crime scene match NMS-08.
23 Mr. Tobin concludes, based upon all of the criteria detailed in his Affidavit,
24 that this conclusion is “unfounded.” Tobin, 46. This Court should find Ms.

25

1 Geil's proffered testimony lacks the reliability Washington law requires prior
2 to its admission.

- 3
4 3. Ballistic identification testimony will not help the jury
5 understand the evidence or determine a fact in issue pursuant to
6 ER 702.

7 Expert testimony is only admissible if it will assist the trier of fact in
8 understanding the evidence or to determine a fact in issue. ER 702. Ballistics
9 identification testimony in Mr. DeJesus' case will do neither.

10 In her 2015 interview, Ms. Geil uses the phrase "practical certainty."
11 She also stated she was "100% confident" in her opinions. Undersigned
12 counsel is unfamiliar with the phrase "practical certainty," but it bears a
13 striking resemblance to the more familiar phrase that something is true to a
14 "reasonable degree of scientific certainty."

15 On December 1, 2015, the National Commission on Forensic Science
16 issued its report to the Attorney General of the United States (AG). See
17 Appendix E. The report recommends the AG adopt a policy abolishing the
18 use of the phrase "reasonable degree of scientific certainty."

19 In addition to being inconsistent with the *Frye* standard, the phrase has
20 two additional problems:

- 21
22 1. There is no common definition across science or within disciplines as
23 to what threshold establishes "reasonable" certainty. Therefore,
24 whether couched as "scientific certainty" or "[discipline] certainty,"
25 the term is idiosyncratic to the witness.
2. The term invites confusion when presented with testimony expressed
in probabilistic terms. How is a lay person, without either scientific or

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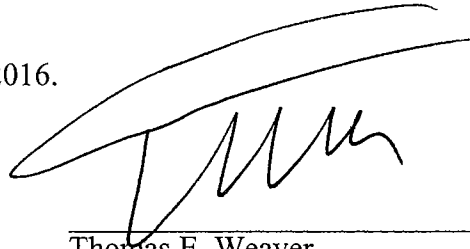
legal training, to understand an expert's "reasonable scientific certainty" that evidence is "probably" linked to a particular source?

In other words, the phrase fails to assist the trier of fact in determining the material issues and only confuses the issues in the minds of lay people. This Court should find Ms. Geil's testimony will not assist the trier of fact and exclude her testimony.

D. Conclusion

This Court should enter an ordering precluding Ms. Geil or any other State's witness from testifying about ballistics identification during the trial of Mr. DeJesus.

Dated this 19th day of February, 2016.



Thomas E. Weaver
WSBA #22488
Attorney for Defendant

Appendix A

**IN THE SUPERIOR COURT OF THE STATE OF WASHINGTON
IN AND FOR THE COUNTY OF KITSAP**

STATE OF WASHINGTON, }

Plaintiff, }

vs. }

GERALDO DeJESUS, }

Defendant. }

Case No: 15-1-00972-7

**AFFIDAVIT OF WILLIAM A. TOBIN IN SUPPORT OF DEFENDANT’S
FRYE MOTION TO EXCLUDE OR LIMIT FIREARMS
IDENTIFICATION TESTIMONY**

I, William A. Tobin, under penalty of perjury in the State of Washington, declare as follows:

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- A. Case-Specific Documents and Request for Scientific Review**
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- C. Specific Qualifications Applicable to Forensic Firearms Identification**
- D. Forensic Individualization Defined and Acceptance in Scientific and Scholarly Forensic Communities**
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M. Unfounded Expressions of Individualization, Certainty, and Implications of Case-Specific Opinions

N. Summary

A. Case-Specific Documents and Request for Scientific Review

1. Among numerous others, I reviewed the following relevant documents provided by Counsel for Defendant in captioned matter:

- (a) Kitsap County Superior Court Charging Document (4 pages);
- (b) Certificate of Probable Cause (9 pages);
- (c) Numerous email printouts;
- (d) *Curriculum vitae* of Forensic Examiner Kathy Geil (4 pages)
- (e) Washington State Patrol (WSP) Crime Laboratory documents Bates pages 858-871, and 902-903 (electronic and printouts);
- (f) Additional email printouts, crime laboratory reports, underlying benchnotes & worksheets, GRC search results, *inter alia*, including Bates pages 2251-2297 (electronic and printouts).

I was asked to conduct a scientific review of the aforementioned documents reporting the results of the State's firearms identification examiner's opinions in the case *sub judice*, for an opinion as to the scientific foundations underlying firearms identification forensic practice, and as to how the true [mainstream] scientific community views the forensic practice. For the opinions expressed herein, it is not necessary for a forensic metallurgist/materials scientist to have examined actual case-specific items of evidence in order to opine on the scientific foundation, *vel non*, of the firearms identification examiner's opinion. If called to testify, I would testify as follows:

B. Background Overview as Materials Scientist / Metallurgist

2. I have a Bachelor of Science degree in Metallurgy from Case Institute of Technology¹ in Cleveland, Ohio, and graduate studies in metallurgy and materials science at Ohio State University and the University of Virginia. While in graduate school, I accepted an offer of employment by the Federal Bureau of Investigation (FBI) as a Special Agent in 1971. After serving approximately 3½ years as an investigative (“street”) Agent, I was assigned to the FBI Laboratory in Washington, D.C., as a forensic metallurgist/materials scientist because of my prior academic and professional experience, where I remained until my retirement as the manager of forensic metallurgy operations in 1998. During my career at the FBI Laboratory, I undertook additional graduate studies in materials science (metallurgy) at the University of Virginia, and also studies for a Master of Arts in Special Studies at George Washington University (GWU), a program sponsored and instructed by both the Forensic Science Department and Law School at GWU.

By congressional mandate, the FBI Laboratory is charged with providing assistance “to all duly-authorized law enforcement agencies” throughout the U.S. Because no forensic metallurgy component existed in any state, local, or other federal law enforcement entity in the United States, or even in most federal regulatory (non-law enforcement) entities such as the Occupational Safety and Health Administration (OSHA), Food and Drug Administration (FDA), or Department of State, *inter alia*, the FBI Metallurgy Unit provided requested assistance for all federal, state and local criminal, civil and non-litigious matters, and periodically for the international community in foreign police cooperation matters. From the retirement of the former FBI Chief Forensic Metallurgist in 1986 until my own retirement in 1998, my unit was personally responsible for virtually all forensic metallurgical examinations requested of the FBI by all local, state, federal, and

¹ Case Institute of Technology is now known as Case Western Reserve University.

foreign agencies. Such assistance included my participation with the National Transportation Safety Board (NTSB) in determination of the cause(s) of the TWA 800 midair explosion disaster over Long Island, N.Y., the nation's worst rail disaster (the "Sunset Limited" in Mobile, AL), the nation's second worst environmental disaster (oil spill by the "Emily S./Morris J. Berman"), and numerous other high profile incidents. Because of the volume of high profile cases for which I was responsible, my scientific work product has been subject to substantial public and Congressional scrutiny in the United States and internationally throughout my career as a forensic metallurgist/materials scientist.

Included in my academic background are various courses typical of a metallurgy/materials science curriculum, at both an undergraduate (U) and graduate (G) level. Most directly or indirectly relate to production and functioning of the entire spectrum of metal and non-metal products and components, including firearms, bullets, and cartridge cases. The following list of courses, not all inclusive and generally in reverse chronological order, are included in my academic background:

- a. Manufacturing Processes & Materials (G)
- b. Statistics for Scientists & Engineers (G)
- c. Structure & Properties of Materials (G)
- d. Shaping & Forming of Metals (G)
- e. Engineering Metallurgy (G)
- f. Physical Metallurgy (1 G, 1 U)
- g. Advanced Materials Laboratory (U)
- h. Properties of Materials (U)
- i. Engineering & Mechanical Properties of Materials (U)
- j. Relaxation Properties of Solids (U)
- k. Engineering Applications of Materials (U)

- l. Foundry Metallurgy (U)
- m. Diffusion Processes Laboratory (U)
- n. Diffusion Principles (U)
- o. Plastic Flow Laboratory (U)
- p. Dislocation & Plastic Flow (U)
- q. Metallurgical Processes Laboratory (U)
- r. Fundamental Metallurgical Processes (U)
- s. Behavior of Materials (U)
- t. Production Metallurgy (U)
- u. Thermodynamics (U)
- v. Heat & Mass Transfer (U)
- w. Structure of Crystals (U)
- x. Introduction to Materials (U)

It should be noted that the term 'plastic' in the above listing does not refer to the common usage as the synthetic amorphous polymer solid, but rather describes the non-reversible behavior (deformation) of metals and materials reacting to applied stresses, such as occurs during the cycling of a firearm leaving striations and impressions used by firearms identification practitioners in their pattern-matching forensic practice. It should also be noted that the forensic domain of firearms identification is a less-complex subset of toolmark identification.

During my metallurgy studies and my tenure as an FBI forensic metallurgist, I visited many metal manufacturing and processing plants throughout the United States and Taiwan to study, in detail, a wide variety of industrial manufacturing practices of a wide variety of products exhibiting toolmarks resulting from production processes. I also served as a plant metallurgist in both the copper and aluminum industries, and as a research metallurgist in the field of aerospace and

nuclear metallurgy. My *curriculum vitae* is appended to this affidavit as Appendix C. I have authored or coauthored numerous papers on forensic matters, the latest two of which relate to firearms/toolmarks identification issues similar to those in the case at bar. The scientific principles and issues articulated in both recent papers directly apply to the premises underlying firearms identification forensic practice in general, and to the unfounded claim of the firearms examiner in this specific case. The two papers are, “Hypothesis Testing of the Critical Underlying Premise of Discernible Uniqueness in Firearms-Toolmarks Forensic Practice”, W. Tobin and P. Blau, 53 *Jurimetrics J.* 121-142 (Winter 2013), and “Analysis of Experiments in Firearms/Toolmarks Practice Offered as Support for Low Rates of Practice Error and Claims of Inferential Certainty”, C. Spiegelman and W. Tobin, 12 (2) *Law, Probability & Risk* 115-133 (2013), doi:10.1093/lpr/mgs028. Both papers can be downloaded free of charge from the public website on the Social Science Research Network (SSRN) at: <http://ssrn.com/author=1521077>.

I was asked, and accepted, to serve as a scientific editorial reviewer for the draft final report of the 2004 National Research Council of the National Academy of Sciences (NAS) Committee on Bullet Lead Analysis.

As indicated in my *curriculum vitae*, excluding testimonies before U.S. Senate Subcommittees, I have been qualified as an expert in 262 courts in 45 states/jurisdictions (including D.C.), and have testified in firearms/toolmarks matters over 15 times throughout the U.S.

C. Specific Qualifications Applicable to Forensic Firearms Identification

3. The domain of metallurgists and materials scientists includes material behavior in virtually every phase in the life of a metal, regardless of form, from its extraction as an ore to the use and functioning of a finished product. Each stage of product development, including for consumer tools, involves important

metallurgical considerations, from material selection and process design to bulk metal forming, shaping, heat treatment, finishing, and related production processes. In scientifically evaluating the characteristics (striations and impressions) used by toolmarks examiners in ‘toolmark identification’ practice as it is called, it is imperative that the underlying scientific phenomena affecting material behavior and tribological² interactions with, for example, forming tools and dies, in various conditions and environments of both production and consumer use, are understood. The need to understand the scientific principles governing material behavior and their interactions extends beyond production processes. Clearly, interactions of both the product with its environment, and of the product components with each other in service (ultimate consumer use) such as occur in the cycling of a firearm, are important metallurgical design considerations. Knowledge of the material behavior resulting from the effects of an applied system(s) of stresses (primarily compressive, tensile, and shear) and of friction, lubrication, and wear, is fundamentally important to evaluating the significance of manifestations of tribological interaction (striations and impressions, used by toolmarks identification examiners for their pattern-matching practice), for efficacy of product function, and for failure analysis both in production and in user service. It is particularly important in evaluating the scientific foundations, *vel non*, underlying the pattern-matching practice of toolmarks examiners in their forensic comparisons.

The heart of virtually every metal forming/shaping operation for all firearm components is the tool(s)/die(s) responsible for changing the shape of the metal work piece under pressure (forced contact). This is true regardless of the actual product produced, such as firearms, bullets, ammunition cartridge cases, screwdrivers,

² Tribology is the science and engineering of friction, lubrication, and wear, of two solids in contact and in relative motion.)