The Current State of Firearm & Toolmark Identification Evidence
Introduction

The following material* was modified for presentation at the Northwestern Pritzker School of Law – Center on Wrongful Convictions – Bluhm Legal Clinic

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*Some of the following resource material was provided by the Scientific Working Group for Firearms & Toolmarks (SWGGUN) to assist firearm and toolmark examiners in describing the scientific basis of their discipline.
Outline

- Basic Overview of Science & Forensic Science
- Fundamentals of Firearm & Toolmark Identification
- The Five Prongs of Daubert
- Summary
Outline

- Grzybowski & Murdock (1998) AFTE article – Meeting Daubert Challenge…
- 2008 NRC Report – Ballistic Imaging…- limitations
- Attempted Evaluation of AFTE FA/TM Research by SoFS
Outline

- Attempted Evaluation of AFTE FA/TM Research by AAAS
- Nov. 2015 PCAST Solicitation for Research
- Sept. 2016 PCAST Report
- Oct. 2016 AFTE Response to PCAST Report
Outline

- Feb. 2017 PCAST Addendum
- Summary
- Bias in FA/TM ID
Basic Overview of Science & Forensic Science

- What is Science?
- Scientific Method
- To be Scientific…
- What is Forensic Science?
What is Science?

- A systematic gathering of knowledge.

- The observation, identification, description, experimental investigation and the theoretical explanation of phenomena.
Scientific Method

Procedures for the systematic gathering of knowledge. These procedures generally involve:

- Stating a problem
- Developing a hypothesis
- Testing a hypothesis
- Forming a theory
- Using theories to predict events
Scientific Method


1. Describing the process of firearm and toolmark identification – p. 233
2. The application of the scientific method to firearm and toolmark examination – Appendix #2 – pp. 234-240 – by Bruce Moran & John Murdock
To be Scientific…

- The theory must be testable.

- The theory must be validated through the testing of the fundamental propositions upon which it is based.
What is Forensic Science?

The application of science to law.
Fundamentals of Firearm & Toolmark Identification

- Definitions
- Fundamental Propositions (1 & 2)
- Examination Method
- Range of Conclusions
Definition:

**Firearm & Toolmark Identification**

An empirical comparative analysis that can determine if a striated or impressed toolmark was produced by a particular tool to the practical, not absolute, exclusion of other tools.
Definition: *Tool*

The harder of two objects that comes into forceful contact with one another, resulting in the softer object being marked. A firearm is a collection of tools.
Definition: **Toolmark**

Features imparted on an object by the contact and force exerted from the working surface (e.g., an edge) of a tool.

- **Two Types** –
  - Impressed Toolmarks
  - Striated Toolmarks
Definition: *Impressed Toolmark*

Marks produced when a tool contacts an object with enough compressive force that it leaves an impression.
Definition: *Striated Toolmark*

Marks produced when a tool contacts an object with lateral force and motion.
PISTOL - breech face

- Breech face
- Firing pin aperture
  [firing pin is inside (not visible)]
- Firing pin aperture edge
- Extractor
- Ejector
MARKS LEFT ON EXPENDED CARTRIDGE CASES (cycle of fire marks)*

Breechface mark
Firing pin drag mark
Firing pin impression
Firing pin aperture mark
Ejector mark
Cut-out mark
Magazine Mark
Ejection port mark
Chamber marks
Extractor override & gouge marks

*Original drawing by Lucien (Luke) Haag
RIFLING IN BARREL

Helical grooves imparted inside the barrel
MARKS LEFT ON FIRED BULLETS

Lands & Grooves: Number of helical grooves cut/impressed inside the barrel

Direction of Twist: The direction (to the right or to the left) that lands and groove twist
The Science of Firearm & Toolmark Identification is based on two fundamental propositions:
Proposition #1

Individual toolmarks imparted to objects by different tools will rarely if ever display agreement sufficient to lead a qualified examiner to conclude the objects were marked by the same tool.
Proposition #2

Most manufacturing processes involve the transfer of rapidly changing or random marks onto fabricated pieces such as barrel bores, breechfaces, firing pins, screwdriver blades, and the working surfaces of other common tools. This is caused principally by the phenomena of tool wear and chip formation, or by electrical/chemical erosion. Microscopic marks on tool working surfaces may then continually change due to wear, corrosion, or abuse.
Definition: *Class Characteristics*

General and/or measurable features of a specimen which indicate a restricted group source. They result from design factors, and are therefore determined prior to manufacture.
Examples of Class Characteristics

Known Source: Rifling

Questioned Item: Bullet
Examples of Class Characteristics

Corresponding Blade Dimensions
Definition: **Subclass Characteristics**

Features that may be produced during manufacture that are consistent among some items fabricated by the same tool. These are not determined prior to manufacture and are more restrictive than class characteristics.

There are numerous references that provide guidance to examiners for the evaluation of subclass influence.
Example of Subclass

Note continuous, evenly spaced striated toolmarks
NOTES ABOUT SUBCLASS

- Not every machining process produces subclass characteristics
- The machining processes that usually produce subclass characteristics do not always transfer them to the workpiece
- When subclass markings are produced on workpieces, ID may still be possible within or adjacent to the subclass markings
NOTES ABOUT SUBCLASS

- Subclass characteristics may be present near the working edges of tools and yet have no influence on the production of individual toolmarks.
- Subclass characteristics may be present on the working edge of a tool, but due to the angle of application of the tool edge to a marked object, no subclass-influenced toolmarks are produced.
NOTES ABOUT SUBCLASS

Subclass characteristics mimic individual characteristics by being in the same relative position in two toolmarks that were produced by different tools and can, therefore, be mistaken for individual matching characteristics (e.g., on firearm breechface impressions).
NOTES ABOUT SUBCLASS

- Similar toolmarks resulting from the manufacturing process can result in different breechfaces that will produce very similar breechface impression toolmarks on fired cartridge cases. These similar breechfaces do not produce subclass characteristics because, if examined closely, the resulting similar breechface impressions can be distinguished from one another because the impressed toolmark detail will not be in the same relative positions. But, if not examined critically, misidentifications can occur.
Definition: *Individual Characteristics*

Marks or features produced by the random imperfections or irregularities of tool surfaces. These characteristics can be used to individually associate a toolmark to a tool, to the practical exclusion of other tools.
How are individual characteristics produced?

These random imperfections or irregularities can be produced by:

- Manufacture
- Wear from use
- Wear from abuse
- Damage and corrosion
Example of Individual Characteristics from Manufacture
Example of Individual Characteristics from Wear

*Use*  

*Abuse*
Examination Process

Class Characteristics

- Elimination, but not individualization, can occur here
Examination Process

Comparison Microscopy

- Individualization evaluated here, after subclass influence is ruled out
Range of Conclusions

- Identification
- Inconclusive
- Elimination
- Unsuitable

Adopted by AFTE 1992
Range of Conclusions - *Identification*

Agreement of a combination of *individual* characteristics and all discernible class characteristics where the extent of agreement exceeds that which can occur in the comparison of toolmarks made by different tools and is consistent with the agreement demonstrated by toolmarks known to have been produced by the same tool.
Examples of an Identification
These photographs illustrate matching firing pin aperture shear marks (typical Glock markings).
Range of Conclusions - *Inconclusive*

a. Some agreement of individual characteristics and all discernible class characteristics, but insufficient for an identification

b. Agreement of all discernible class characteristics without agreement or disagreement of individual characteristics due to an absence, insufficiency or lack of reproducibility.

c. Agreement of all discernible class characteristics and disagreement of individual characteristics, but insufficient for an elimination.
Examples of an Inconclusive (a)
Examples of an Inconclusive (b)
Range of Conclusions - *Elimination*

- Significant disagreement of discernible class characteristics and/or individual characteristics.
Examples of an Elimination
Examples of an Elimination
Range of Conclusions - Unsuitable

- Unsuitable for examination
  - Item is either too damaged or too small (no useable toolmarks for comparison purposes)
Basis for Firearm & Toolmark Identification

- Standards of Identification
- Subjective Evaluations
- What makes an Identification possible?
- Significance of Conclusions
Identification Standard - I

“The Theory of Identification as it pertains to the comparison of toolmarks enables opinions of common origin to be made when unique surface contours of two toolmarks are in ‘sufficient agreement.’”

AFTE Theory of Identification (1992)
Identification Standard - II

“Agreement is significant when the agreement in individual characteristics exceeds the best agreement demonstrated between toolmarks known to have been produced by different tools and is consistent with the agreement demonstrated by toolmarks known to have been produced by the same tool.”

AFTE Theory of Identification (revised 2011)
“The sufficient agreement threshold is exhibited when the amount of agreement is greater than best known non-matches established by the community and conveyed to each examiner through a lengthy and extensive training program. That is, it is not an arbitrary point. In fact, by definition, no non-matches can ever have more similarity than the sufficient agreement point.”
Identification Standard - III

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

AFTE Theory of Identification (revised 2011)
Identification Standard Summary

In the application of the AFTE Theory of Identification, the subjective determination of whether sufficient agreement of individual characteristics is present for identification must be made by a qualified examiner.
Conclusions in Toolmark Identification are based on a subjective evaluation of the amount of agreement that is observed between two toolmarks. This does not mean that this type of evaluation is unreliable or unscientific. There is subjectivity in every science and in every test; for example, when a doctor diagnoses a head cold or a histologist examines slides for cancer cells.
Subjective Evaluation (cont’d)

“It is through rigorous training that examiners develop their criteria for what constitutes an elimination, an identification, or an inconclusive result. They learn and understand the differences in microscopic agreement between toolmarks created by the same source (a known match) and toolmarks created by different sources (a known non-match) and how that understanding factors into any conclusion of elimination, inconclusive, or identification. Examiners do not memorize all patterns that have been observed.” (emphasis added)
Objectives Evaluation

“Attempts have been made in establishing a more objective criteria called Quantitative Consecutive Matching Striae (QCMS) which is in use by some firearm and toolmark examiners; however, it is not yet employed universally. QCMS is a way of describing in numerical terms an identification after traditional pattern matching methods have been employed [to find potential matching areas]. It should be noted that currently QCMS can only be employed when striated marks are involved and is not yet capable of capturing impressed marks which are routinely encountered by examiners in casework.”

Criteria:

3D – two groups of 3 CMS (3X) or one 6X run of CMS
2D – two groups of 5 CMS (5X) or one 8X run of CMS
(subclass influence must be eliminated as a factor)
What makes an identification possible?

- Proposition #2
- A sound examination method
  - By employing the precepts of empirical research or study in the comparison of two toolmarks.
- Specialized training to develop cognitive skills
  - An examiner undergoes standardized technical training that develops cognitive skills to recognize, differentiate, and understand the patterns of marks and when they are unique.
Significance of Conclusions

Based on Propositions #1 and #2, an individual association or identification conclusion can be made. These individual associations are made to a “practical certainty”. They are not made to an “absolute certainty”.
Significance of Conclusions (cont’d)

In 2012, the CCCSO laboratory adopted the following statement:

“**Strength of Associations Made in the Identification of Firearm and Non-Firearm Toolmarks**

The identification of toolmarks is made to the practical, not absolute, exclusion of all other tools. This is because it is not possible to examine all firearms or tools in the world, a prerequisite for absolute certainty. The conclusion that sufficient agreement for identification exists between two toolmarks means that the likelihood another firearm or tool could have made the questioned mark is so remote as to be considered a practical impossibility.”
Definition of “Practical Impossibility”

A phrase, which currently cannot be expressed in mathematical terms, that describes an event that has an extremely small probability of occurring in theory, but which empirical testing and experience has shown will not occur. In the context of firearm and toolmark identification, “practical impossibility” means that based on 1) extensive empirical research and validation studies, and 2) the cumulative results of training and casework examinations that have either been performed, peer-reviewed, or published in peer-reviewed forensic journals, no firearms or tools other than those identified in any particular case will be found that produce marks exhibiting sufficient agreement for identification.”

AFTE Glossary, 6th Ed., 2013
Five Prongs of Daubert
(May also apply to Frye)

- Testability
- General Acceptance
- Peer Review
- Known or Potential Error Rate
- Maintenance of Standards & Controls
Definition: *Testability*

A critical evaluation process that supports or refutes a hypothesis.
What evidence exists to support the science of Firearm & Toolmark Identification?

- Numerous empirical and validation studies of consecutively manufactured tools have been published over the past 90+ years.
- Many pre-date the 1993 Daubert decision, and many more have been done since then – spurred on by Daubert (a very good decision)
Some Consecutive Manufacture Studies: Gun Barrels (Cut Rifling)

- Lutz (1970)
- Skolrood (1975)
- Brown & Bryant (1995)
- Brundage (1998)
- Miller (2000)
- Hamby (2009)
Consecutive Manufacture Studies: Gun Barrels (Forged Rifling)

- Murdock (1981)
- Hall (1983)
- Matty (1985)

Electrochemical Rifling

- DeFrance (2003)
Consecutive Manufacture Studies: Other Firearm Components

- Bunch & Murphy – Glock Breechfaces (2003)
- Lyons – Caspian Extractors (2009)
- Fadul – Glock EBIS Barrels (2011)
Some Consecutive Manufacture Studies: Other Tools

- Flynn – Chisels (1957)
- Burd & Gilmore – Screwdrivers (1968)
- Butcher & Pugh – Bolt Cutters (1975)
- Reitz – Drill Bits (1975)
- Watson – Knives (1978)
- Cassidy – Pliers (1980)
- Tuira – Knives (1982)
Some Consecutive Manufacture Studies: Other Tools

- Van Dijk – Steel Stamps (1985)
- Eckerman – Chisels (2002)
- Clow – Knives (2005)
Summary of Empirical Research

These studies have been found to support Proposition #2:

Most manufacturing processes involve the transfer of rapidly changing or random marks onto fabricated pieces such as barrel bores, breechfaces, firing pins, screwdriver blades, and the working surfaces of other common tools. This is caused principally by the phenomena of tool wear and chip formation, or by electrical/chemical erosion. Microscopic marks on tool working surfaces may then continually change due to wear, corrosion, or abuse.
Definition: *General Acceptance*

The approval by a particular authoritative body of a technique or methodology.

In addition to the forensic science community:

- Numerous colleges & universities have courses in Firearm & Toolmark Identification
- Funding of scientific research in the area of Firearm & Toolmark Identification has been granted to researchers outside the firearm and toolmark community.
- Accepted in court testimony for over 100 years
- American Council on Education (ACE) awarded college credit in FA/TM identification to students of the US Army Criminal Investigation Laboratory
## Some Academic Programs with FA/TM Curricula

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Grant Programs

- National Institute of Justice, Washington, D.C.
- AGIS, Brussels Belgium
- Canadian Police Research Centre, Ottawa, Canada
Training Programs for Firearms Identification

- **National Institute of Justice, Washington, D.C.**
  - NIJ - in conjunction with the National Forensic Science Technology Center (NFSTC) – funded a distance learning program titled ‘Firearms Examiner Training Program’ to augment training for new examiners,

- **Federal Bureau of Investigation (FBI)**
  - Since 1986, the FBI has offered a one week course titled ‘Specialized Techniques in Firearms Identification’. The course has been attended by several hundred firearms examiners.

- **Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF)**
  - Since 1999, the ATF has offered a one-year long course titled the ‘National Firearms Examiner Academy. To date, approx. 190 firearms examiners have attended the NFEA.

- **California Criminalistics Institute (CCI), CA DOJ**
  - For more than 25 years, CCI has offered a variety of specialized courses in firearms and toolmark related fields.
Definition: *Peer Review & Publication*

The evaluation of a colleague's research.

Selected Peer Reviewed Journals

- Association of Firearm & Tool Mark Examiners—*AFTE Journal*, since 1969
- American Academy of Forensic Sciences - *Journal of Forensic Sciences*, since *cir.*1942
Definition: *Error Rate*

The frequency at which one deviates from a correct standard. Errors can occur from a number of sources and may result in a:

- **False Positive Error:** Identification of a toolmark to a tool when the questioned toolmark was not produced by the tool.

- **False Negative Error:** Elimination of a toolmark as having been produced by a tool when the toolmark was produced by the tool.

- Firearms False Positive = 1.9%
- Firearms False Negative = 0.4%
- Toolmark False Positive = 2.2%
- Toolmark False Negative = 2.0%

Some Validity Study Error Rates

- Brundage (1998) 0%
- Hamby & Thorpe (2001) (Ph.D thesis) 0%
- Bunch & Murphy (2003) 0%
- DeFrance (2003) 0%
- Thompson & Wyant (2003) 0.78%
- Smith (2005) 0%
- Orench (2005) 0%
- Hamby, Brundage, & Thorpe (2009) 0%
- Fadul, Hernandez, et al (2012) 0.0006 %
Maintenance of Standards & Controls

- The establishment and maintenance of operational guidelines/protocols for conducting analytical testing, monitoring quality assurance and controls.

- Representative documents:
  - Agency Technical Protocols
  - SWGGUN Guidelines
  - AFTE Technical Procedures Manual
  - AFTE Theory of Identification
  - AFTE Glossary
  - AFTE Training Manual
  - ISO 17025:2011
  - OSAC Standards and Guidelines
Summary

Firearm & Toolmark Identification meets the reliability standard put forth by the Daubert (Frye) decision because it:

- is Testable
- is Generally Accepted
- is Peer Reviewed
- has Known Error Rates
- Maintains Standards & Controls


Potential Roadblocks to Admissibility

   1. Did a fair amount of research
   2. Questioned the ability to identify toolmarks
   3. Stated limitations (pgs. 18 & 20):

   “1-A-2 Limitations: What the Committee Study Does Not Do

   First, and most significantly, this study is neither a verdict on the uniqueness of firearms-related toolmarks generally nor an assessment of the validity of firearms identification as a discipline…

   Third, the proposal for this study explicitly precluded the committee from assessing the admissibility of forensic firearms evidence in court, either generally or in specific regard to testimony on ballistic imaging comparisons

   However, we do not in any way offer a determination of whether ballistic evidence should or should not be admissible in court proceedings.”
Potential Roadblocks to Admissibility

   1. Did very limited research
   2. Questioned the ability to identify toolmarks
   3. Stated limitations (p. 7):

   “The committee decided early in its work that it would not be feasible to develop a detailed evaluation of each discipline in terms of its scientific underpinning, level of development, and ability to provide evidence to address the major types of questions raised in criminal prosecutions and civil litigation.”
Attempted Evaluation of AFTE FA/TM ID Research Articles

- Federal Subcommittee on Forensic Science (SoFS, circa 2010)
  - Five Internal Working Groups (IWGs)
    - Research, Development, Testing and Evaluation (RDT&E) is the IWG that requested underpinning research articles from forensic science disciplines, including firearms and toolmarks. In response, AFTE submitted a 94-page list of reference articles to them in June 2011 for evaluation. SoFS was never funded to do this evaluation.
Attempted Evaluation of AFTE FA/TM ID Research Articles

- American Association for the Advancement of Science (AAAS, 2014)
  - Began to conduct an analysis of the underlying scientific bases for the identification of firearms and toolmarks with the goal of recommending a research agenda for areas in which shortfalls, if any, were noted.
  - As of Feb. 2017, this analysis appears to have not been completed, perhaps due, once again, to a lack of funding.
President’s Council of Advisors on Science and Technology (PCAST) Solicitation (November 30, 2015)

- Made to the feature-comparison forensic science disciplines, including firearm and toolmark identification: *What relevant research has been done from 2011 through 2015?*

- AFTE Response – 48 References
  - 37 Papers on:
    - FA ID – Bullets (7)
    - FA ID – Cartridge Cases (15)
    - Toolmark ID (9)
    - FA/TM ID Theoretical (4)
    - Fracture Match (2)
  - 11 Papers on:
    - Emerging research – For example, using confocal microscopy to study the topography of toolmarks.

- Critical of FA/TM ID because, with one exception, all past research fails to meet their definition of a black-box study for error rate determination
- The one exception: “A Study of False-Positive and False-Negative Error Rates in Cartridge Case Comparisons” by D. Baldwin, et al., Ames Laboratory, USDOE, Tech Report #15-5207 – April 7, 2014
  - PCAST deemed this one study is not enough; two such studies are needed
AFTE Response to PCAST (Oct. 2016)

- Endorses ongoing research efforts for FA ID and to reduce effects of cognitive bias
- Past research must not be ignored
- The AFTE Theory of ID is not circular logic
- Remains dedicated to the exchange of information, methods, and best practices
OSAC Response to PCAST (Dec. 2016)

- Past FA/TM ID research literature provides foundational validity
- A structured black-box study is not the only useful way to gain insight into both foundations of FA/TM ID and examiner error rates
- The subjective component of FA/TM ID does not make it unscientific
- The AFTE Theory of ID is not circular logic
- Agreed with goals of:
  - Continuing research
  - Implementing more objective analytical methods
  - More robust collaboration between academic and forensic practitioner communities
After considering many responses to their Sept. 2016 report, and any other research that responders wanted to submit, this report addendum essentially states that the Council has not changed its mind and that the Sept. 2016 PCAST report is still valid.
Summary of Motions to Exclude FA ID Evidence Based on PCAST Report

- Monitored by National Association of Attorneys General
Bias in FA/TM ID Casework

- Some crime lab administrators, as well as forensic scientists, promote the concept that it’s the lab’s job to “get the bad guy” — This is wrong!

- Seven sources of potential biasing information:
  - Processing crime scenes/autopsies
  - Having peace officer status
  - Processing suspects for physical evidence
  - Receiving investigative information
  - Interaction with prosecution attorneys (some want to win at all costs)
  - Interaction with defense attorneys
  - Presentation in court
Laboratory Activities to Minimize Bias

- Each lab section must:
  - Decide what contextual information they need to do their job
  - Take steps to restrict information they do not need
- Strive for blind verifications
- Modify policies and procedures to reflect collective concern about possible effects of contextual and confirmational bias
Individual Forensic Scientist Activities to Minimize Bias

- If the lab administration does not devote time to address cognitive influences, each forensic scientist must do what they can to minimize these potentially detrimental influences, especially in borderline cases (close calls)
Current State of Firearm and Toolmark Identification Evidence

- A single study on confirmation bias showed no effect, but more well-designed studies are needed.

- Uniform standards and guidelines, long the purview of individual laboratory policies, are now being formulated by OSAC.
  - These will likely be enforced by accrediting bodies requiring adoption of these standards and guidelines.
Current State of Firearm and Toolmark Identification Evidence

- Meets Daubert and Frye acceptance criteria
  - Ever since Daubert (1993), there has been general acceptance in Federal and State courts with a few exceptions
  - Can mis-identifications occur?:
    - Yes, but are rare; is usually attributed to ascribing too much significance to a small amount of matching agreement
    - Examples of striated mark mis-identifications:
      2. Claude Dallas case – 1982 – Biasotti and Murdock referee opposing results
Claude Dallas Case

DALLAS, CLAUDE LAFAYETTE, JR.

Date of Birth: 3-11-50
Place of Birth: Winchester, Virginia
5' 10'', 180 lbs.
Brown Hair (long, wears ponytail), Brown Eyes.
Full Beard, Wears Glasses.
N.C.I.C. Entry No. W247288563
S.S. No. 270-49-0296
F.B.I. No. 208406 MI
N.C.I.C. F.P.C. 12AA0807041652061308
No known scars or marks.

Wanted for 1st Degree Murder (2 counts) of two Idaho Fish and Game Enforcement Officers, January 5, 1981. Warrants issued Owyhee Co., Murphy, Idaho 83650

F.B.I. Class - 12 MIA - 114 MIROII

CONTACT —
Sheriff Tim Nettleton, Owyhee County, Murphy, Idaho 83650 — (208)495-2441
Ballistic error takes center stage during Dallas murder trial

By Wayne Correll
Idaho Press-Tribune

An Idaho criminalist testified Monday that he was not "pressured" to change his opinion concerning the origin of the bullets found at a site where two Idaho Fish and Game officers were killed.

The testimony came as the trial of Claude L. Dallas, Jr., entered its second week in Third District Court in Caldwell. Dallas, 22, is accused of murdering officers William Peque and Conley Ellis on Jan. 1, 1981.

Richard Craven, a senior criminalist for the state of Idaho, testified that he tested three bullets found at the scene. One of the bullets was found on the ground. Two others were recovered during the autopsy of Conley Ellis.

Craven said he compared the three bullets to test bullets fired from a weapon carried by享受Stevens on the day of the killings.

The bullets also were compared to bullets recovered from a firing range at Paradise Hills, N.Y. The range is located behind the home of George Nielsen, a close friend of the defendant. 

Craven said he tested the bullets after the first comparison he issued an opinion that the bullets from the scene were fired by a pistol carried by Stevens.

He said he later consulted several firearms experts who also reviewed the bullets. After the second test, he said he concluded that the bullets fired were not the same as those taken from the crime scene.

Defense attorney Michael Donnelly asked Craven if he had been "pressured" by law enforcement officials to change his opinion on the origin of the bullets. Craven said he had not.

Under questioning by Donnelly, Craven admitted he had been suspended from doing any criminalistics work since the incident. He said all other work he does is now subject to review.

"Do you have confidence in yourself as an expert?" Donnelly asked.

"Yes," replied Craven.

"Were you thorough in your original test?" Donnelly asked.

"No," Craven said. "At the time, I didn't think the differences (in the test bullets) were significant."

"And you say you have been under no pressure to change your original opinion?"

"None, whatsoever."

Craven added that the case was marked to bring in experts to counter the claims made by Craven when he examined the bullets.

The case did not include markings of federal, state and county personnel involved in the process.

The jury today watched a videotaped examination of J.L. Riusotti, a criminalist with the California Department of Justice.

Riusotti testified that the bullets collected at the alleged crime scene all came from the same gun. He said the evidence was "untenable."

Canyon County Sheriff's Office Cpl. Bob McJunkin conducts one of the test bullets fired from a weapon carried by Stevens.
False identification
False identification
Positive Identification

Bullet from victim

Fired bullet from Dallas Shooting Range
Current State of Firearm and Toolmark Identification Evidence

- Using Daubert acceptability criteria, some courts have encountered very poor quality casework – characterized by few notes, no photographs, and the inability of expert witnesses to discuss scientific underpinning literature.
  - As a result, judicial decisions were rendered that limited what could be said about FA/TM identifications.

- Where casework has been thorough, well-documented [including complete (not merely representative) photodocumentation of the basis for identifications], with verification, technical, and administrative review, the justice system can rely on the results of firearm and toolmark identification.