likelihood another tool could have made the marks is so remote as to be considered a practical impossibility.

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

In accordance with the AFTE Theory of Identification, and a commitment to standardization, AFTE has developed a specific range of conclusions possible when comparing toolmarks. As adopted in 1992, the range of conclusions was preceded by: "The examiner is encouraged to report the objective observations that support the findings of toolmark examinations. The examiner should be conservative when reporting the significance of these observations." These two statements were designed to give the examiner license to explain his or her reasoning for reaching his or her conclusions. These conclusions are based on a specific comparison of individual characteristics, having eliminated any possibility of subclass influence. They are:

1. **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.

2. **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 discernable class characteristics and disagreement of individual characteristics, but insufficient for an elimination.

3. **Elimination:** Significant disagreement of discernible class characteristics and/or individual characteristics.

4. **Unsuitable**: Unsuitable for examination.

It is important to note that the word "inconclusive" does not have to be included in a laboratory report. Each of the subcategories under Inconclusive above were designed to stand alone, as conclusive findings. The word "inconclusive" was chosen simply because the three associative evidence statements, a), b), and c) are findings less conclusive than Identification.

Biasotti, A. (1959). A Statistical Study of the Individual Characteristics of Fired Bullets. *Journal of Forensic Sciences*, vol. 4 (1), 34-50.

Validity study in which no more than three consecutively matching striations (CMS) were found on lead bullets fired from different guns and no more than four CMS were found on jacketed bullets fired from different guns.

Burrard, G. (1934). The Identification of Firearms and Forensic Ballistics. Herbert Jenkins, London.

The Gutteridge case is described where 1375 revolvers of the same make/model were compared with the suspect revolver. Six of the 1375 had similar irregular indentations on the breechfaces. Test firings from these six were distinctly different from each other and from the toolmarks on the "crime" cartridge case, which matched test firings from the suspect revolver.

Miller J., and McLean M., Criteria for Identification of Toolmarks, *AFTE Journal,* Vol. 30, No. 1, Winter 1998, pp. 15-61.

Miller J., Criteria for Identification of Toolmarks, Part II, *AFTE Journal*, Vol. 32, No. 2, Spring 2000, pp. 116-131.

Miller J. and Neel M., Criteria for Identification of Toolmarks, Part III, *AFTE Journal*, Vol. 36, No. 1, Winter 2004, pp. 7-38.

Extensive three-part study on striated toolmarks contained on various caliber fired bullets was conducted by using a computer to correlate the KM and KNM striae groups of these test-fired specimens. These studies validated Biasotti's previous work that concluded consecutiveness of matching striae is more reliable than percent of matching striae. Additionally, these studies support the conclusions made by examiners using the conservative quantitative consecutive matching striae criteria authored by Biasotti and Murdock in 1997.

Smith, Erich. "Cartridge Case and Bullet Comparison Validation Study with Firearms Submitted in Casework." AFTE Journal, vol. 37 (2), Spring 2005, pp. 130-135.

This validation study was designed to test the accuracy of examinations by trained firearms examiners who use pattern recognition as a method for identification. Eight FBI examiners took the test that consisted of both bullets and cartridge cases. No false positives or false negatives were reported.

John Murdock - Re: Policy/Procedures for Inconclusive Findings

From: John Murdock
To: Joseph_Thibault@isp.state.il.us
Date: 3/25/2010 8:22 AM
Subject: Re: Policy/Procedures for Inconclusive Findings
CC: Chris Coleman; jmurdock@so.cccounty.us

Joe:

I work as a contract examiner here at Contra Costa County and the views expressed in my responses to your questions are mine alone and do not necessarily represent the views of this laboratory. The Supervisor of the comparative Evidence, my boss, Chris Coleman, is also a skilled Firearms/Toolmark Examiner. Chris told me he will probably respond to your questions. And now, my responses to your questions.

1) "Inconclusive" is definitely a conclusion but should never stand alone because, if this word is used as the result of an examination, it requires an explanation in order to be understood by Crime Lab clients. And, since this word requires an explanation to be understood, why not just omit the word, and simply include the explanation. Furthermore, "Inconclusive" standing alone as an examination result is not required by the AFTE Range of Conclusions. The two sentence paragraph preceding the AFTE Range of Conclusion spectrum of statements (see page 276 AFTE J Vol 22, #3, July 1990) reads as follows: "The examiner is encouraged to report the objective observations that support the findings of tool mark examinations. The examiner should be conservative when reporting the significance of these observations." Three types or categories of objective observations are listed under the Range of Conclusions section 2) Inconclusive. This spectrum of less-than-definitive observations is limited to 2A, 2B and 2C and is based on the fact that the features on firearm and non-firearm toolmark evidence that we evaluate are objective. We can see them and could even measure them if we wished. While it is true that these "objective" features can be perceived differently by different examiners based on their pattern recognition ability, especially fine detail at high magnification, for the most part they will be "seen" in the same way by different examiners. Having reported these "objective observations", the examiner is instructed, in sentence two of the Range of Conclusions preceding paragraph, to report the "significance of these observations" and to do so in a conservative way. If section 2A is the end result of a comprehensive toolmark examination, it may be appropriate to conclude, for example, that it is highly likely that the submitted tool was used to make the questioned toolmark or that the questioned bullet was fired through or in the submitted firearm. The word "inconclusive" does not, in my opinion, have to appear anywhere in the report.

2) Your statement..."as we know, if that same examiner were to look at that evidence again at a later date, they may come to a more definitive conclusion (Id or eliminate)", concerns me. The casual way you state this makes me think that this is not an unusual occurrence in your lab system. If this is true, could it be because there are artificially imposed time limits to your casework. If an examiner has to produce a certain number of cases in a given time period, thoroughness and quality might suffer. The only time this (a more definitive conclusion at a later date) should happen is if additional evidence is submitted or if something was overlooked during the first examination. In my opinion, the standard should be for an examiner to do a through and comprehensive examination, which includes complete photo-documentation, that survives skillful technical peer review such that if the case were re-examined by the original examiner or an equally skilled examiner at a later time, either one would reach the same conclusion(s) reported originally.

If additional evidence is submitted that would allow a more definitive conclusion to be reached later, simply open another submission on the case and write a new report. No need to worry about the original results, because they were the best that could be rendered at that time, based on the evidence available then.

If a mistake is discovered in the original casework after a report has been generated, simply write an amended report and fall on your sword by clearly informing the client, in writing in the amended report, what that mistake was and how this amended report corrects it.

3) Through documentation is required that clearly supports any reported conclusions. Scientific record keeping requires nothing less. Since the evaluation of toolmarks (firearm and non-firearm) is based on what can be seen, quality photo-documentation is mandatory.