Bang...Now What?

Forensic Issues
What evidence have we created?

More importantly

How do we properly interpret it?
Three Types of Evidence

• A. Firearms/toolmarks (Ballistics)

• B. Gunshot residue

• C. Comparative bullet lead analysis
Gunshot Residue
Cartridge primer

a. Barium nitrate

b. Antimony Trisulfide

c. Lead styphnate
Analysis

• A. Field collection

• B. Laboratory analysis
  • 1.) Atomic Absorption Spectrometry
Field Collection

• A. Who does the collection?
• B. What is their training?
• C. What protocol do they use?
• D. How will their protocol and training effect the interpretation of the data?
INSTRUCTIONS FOR COLLECTING GUNSHOT RESIDUES (GSR)
(These instructions comply with the S.B.I. recommended GSR Collection procedure.)
(READ ENTIRE INSTRUCTIONS BEFORE USING)

NOTE
In control test firings, it has been shown that the concentration of gunshot residue significantly declines after approximately 4 hours. In view of these findings, it is recommended that samples taken more than 4 hours after firing not be submitted for analysis.

ADHESIVE LIFT PROCEDURE

(A) When the cap is removed from the clear plastic vials containing the SEM stubs, the adhesive collecting surface is exposed and care must be taken to not drop the stub or contaminate the surface by allowing the surface to come in contact with an object other than the area that is to be sampled. (See Figure 1.)

(B) Heavily soiled or bloody areas should be avoided if possible.

(C) When pressing the stubs on the questioned areas, sufficient pressure should be applied as to cause a mild indentation onto the surface of the hand.

(D) Allow kit to reach room temperature before using.

Fig. 1

STEP 1 Put on the disposable gloves provided in this kit. Do not substitute with other gloves!

NOTE: The gloves provided in this kit are approved barrier-type gloves and will help protect you from bloodborne pathogens.

STEP 2 RIGHT BACK:

(A) Carefully remove the cap from the vial labeled RIGHT BACK.

(B) While holding the vial cap, press the collecting surface of the stub onto the back of the subject’s right hand until the area shown below in Figure 2 has been covered.

(C) After sampling the back of the subject’s right hand, return the cap, with metal stub, to the RIGHT BACK vial.

STEP 3 RIGHT PALM:

Repeat the procedure described in Step 2, using the metal stub in the vial marked RIGHT PALM. Make sure to sample the area shown below in Figure 3.

STEP 4 LEFT BACK and LEFT PALM:

For collection from the left hand, repeat Steps 2 and 3 using the vials labeled LEFT BACK and LEFT PALM.

STEP 5 After sampling all four areas, return capped vials to kit envelope, then proceed with the handwiping procedure described on the back of this instruction sheet.

Fig. 2 (BACK)  

Fig. 3 (PALM)
Quantitative Chemical Analysis
Fischer and Peters

• “In practical situations, however, obtaining a sample suitable for analysis is often a source of major difficulty and frequently limits the validity of the final result. The analytical chemist must be very concerned about the origin of his samples…”
“Who Arrests Shooters????
Who Analyzes GSR?
Shooters Arrest Shooters

The weakness of GSR analysis. Did the GSR come from the crime scene or the arresting officers or the lab?
Secondary Issues

Is it really GSR or

A. Burned pyrotechnic material (fireworks)

B.) Residue from automotive brakes
Firearms toolmarks
“This cartridge case came from that gun and no other gun!
Opponents
Association of Firearms and Toolmarks Examiners
SWGGUN

Scientific Work Group on Guns
Web Site SWGGUN.org

“The purpose of the SWGGUN is to develop a series of consensus guidelines for the firearm and toolmark discipline and to disseminate SWGGUN guidelines, studies and other findings that may be of benefit to the forensic community.”
SWGGUN Projects

• 1. Trigger Pull Evaluation..

• 2. Minimum Qualifications of trainees

• 3. ISO Transition-defining the standards

• 4. Daubert Challenges
Two Camps

• Ipse Dixit Gang: Subjective without standards

• Consecutive Matching Striations: Objective but difficult to defend
Stephen G. Bunch Ph.D. FBI

“The final practical difficulty involves explaining and defending in the courtroom conclusions resting on a CMS regime. Examiners schooled in subjective methods may fail to understand or appreciate the research and the logic of interpreting this kind of evidence…. If firearm examiners wrestle with them less successfully, it could be a blow to the profession and to the administration of justice.”
Schwartz Gang
A SYSTEMIC CHALLENGE TO THE RELIABILITY AND ADMISSIBILITY OF FIREARMS AND TOOLMARK IDENTIFICATION

Adina Schwartz

Firearms identification, often improperly referred to as "ballistics identification," is part of the forensic science discipline of toolmark identification. Despite widespread faith in "ballistics fingerprinting," this article contends that because of systemic scientific problems, firearms and toolmark identifications should be inadmissible across-the-board. This article explains that similarities between toolmarks made by different tools and differences between toolmarks made by the same tool imply that a statistical question must be answered to determine whether a particular tool was the source of an evidence toolmark. What is the likelihood that the toolmarks made by a randomly selected tool of the same type would do as good a job as the toolmarks made by the suspect tool at matching the characteristics of the evidence toolmark? Firearms and toolmark examiners evade this question by claiming to be able to single out a particular firearm or other tool as the source of an evidence toolmark.
• Class characteristics
• Rifling
• Caliber
• Subclass characteristics
• Toolmarks made by same tool on different guns
• Individual characteristics (striations, ejector marks, etc.)
Class characteristics
Individual characteristics
This bullet/cartridge came from only that weapon!
But How Many Guns Exist? Tens of millions!

Have you examined all the guns out there? Of course not!
Likelihood of error?

**Statistical issue**
Possibility that bullet/cartridge
Actually came from another gun
A Statistical Study of the Individual Characteristics of Fired Bullets*

Alfred A. Biasotti, B.A., M.C., San Jose, California

An almost complete lack of factual and statistical data pertaining to the problem of establishing identity in the field of firearms identification prompted this study to be undertaken. It was hoped that some factual data could be collected to answer the fundamental question of what constitutes an identity or non-identity of a pair of fired bullets. The means selected for obtaining this data was to conduct a direct statistical count of the elements which actually form the basis of the identity; e.g., the individual characteristics. Since only one make and type of gun was studied, the class characteristics are identical and therefore were considered constant for statistical purposes.

The direct visual comparison of the fired bullets with a conventional comparison microscope (Figure 1) employing direct oblique illumination was the means of observation se-
IPSE DIXIT

I SAID IT THEREFORE IT IS!!!
Subclass Characteristics

Markings (Not class characteristics) from one tool on a number of different objects
Subclass v. Individual

• How does the examiner know that the toolmarks are not subclass versus individual characteristics…

• And therefore not uniquely identified with only one firearm.
Floundering without standards

- NC SBI lab does not take photographs of bullet comparisons because the camera will not depict what the eye sees.
Vulnerable without Standards
“Q. But without the firearm, isn’t it extremely difficult to tell whether the cartridge casings and the spent projectiles were fired out of the same weapon?

A. That’s correct. That’s the reason why I said it was possible. Until I have the same weapon, I can’t tell—I can’t make that physical match for sure that it was fired by the same weapon. I can say it’s possibly fired by the same weapon.
State v. White

“Q. Can you use the same methodology to compare casings that are found at different locations to determine if those casings were fired by the same gun?...

A. Yes, I can. Particularly if a weapon is reproducing these marks that I described that are produced during the manufacturing process. If that particular weapon is reproducing these mark wells from one cartridge to another, yes, definitely.”
Comparative Bullet Lead Analysis
Analytical Methods

• Bullets broken up into small pieces on impact…Firearms/toolmarks analysis not possible
• Lead from bullet analyzed for three to six elements
• Assumption that no two batches of lead are the same
• Court opinions that bullet originated from same batch of lead, same box of bullets, manufactured on same day at same location.
History

- 1965-66: First forensic use by FBI
- August 10, 1999: First serious challenge
- 2004: FBI commissions NAS to study
- September 1, 2005: FBI abandons use
- After its use in 2500 cases involving 500 trials.
- 2005: FJP sues for names of all victims of CBLA
First Serious Challenge

8/10/99

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Dear Dr. Whitehurst,

I was referred to you by Mr. Jack Venturi, Esq., who spoke to you at the recent National Association of Criminal Defense Lawyers meeting in Washington, D.C. and who also was my brother's trial attorney in 1997. My brother, Michael Behn, was arrested in 1995 for a murder he did not commit - the murder of a coin dealer in South River, New Jersey. He was convicted in May 1997. This was a capital case, but the case never went to the sentencing phase, as the jury could not unanimously agree on the own conduct charge.

Dr. Whitehurst, we firmly believe that my brother did not commit this crime. There was no physical evidence linking him to this crime, no weapon, no blood, nothing. The victim, Mr. Robert Rose, was shot four times in the back of the head and apparently was bound at the hands, although whatever was used to bind his hands was also not found.
FBI Commissions NAS

Forensic Analysis:
Weighing Bullet Lead Evidence

Committee on Scientific Assessment of Bullet Lead Elemental Composition Comparison
Board on Chemical Sciences and Technology
Division of Earth and Life Studies

NATIONAL RESEARCH COUNCIL
OF THE NATIONAL ACADEMIES
FBI Abandons CBLA

AP Breaking News

FBI Drops Controversial Bullet Tests

By MICHAEL J. SNIFFEN, Associated Press Writer
Thursday, September 1, 2005

(09-01) 18:37 PDT WASHINGTON, (AP) —

The FBI decided Thursday to stop tests that match bullets by lead content, a practice criticized as producing a high rate of false matches between crime scene bullets and bullets taken from suspects.

The bureau said it was informing 300 state, local and foreign law enforcement agencies that had received positive match reports from the FBI Laboratory since 1966. The FBI said it had not determined those results were wrong but informed them so they could take whatever action they deem appropriate.

Criminal defense attorneys have contended that re-evaluation of these tests could affect some convictions on appeal. One New Jersey defendant has been granted a new trial because of questions about the bullet test analysis, and a convicted double murderer in New Zealand has requested a pardon based on questions about the test.

Jack King, National Association of Criminal Defense Lawyers spokesman, said defense attorneys will track down most defendants in those 300 cases. "Now, we need the FBI to provide a live witness, a scientist from the FBI Lab, to testify at post-
The Beginning