

***Association of Firearm and
Tool Mark Examiners***

38th Annual Training Seminar



AFTE • 2007
SAN • FRANCISCO

May 27th – June 1st

San Francisco, California



AFTE 2007
38th Anniversary Training Seminar
May 27th – June 1st, 2007



AFTE 2007 HOST COMMITTEE

Finance & Registration

John Sanchez – Chair
San Francisco Police Department

Lillian Lau – San Francisco PD
Andy Smith – San Francisco PD

Vendors & Exhibitors

Rick Bailon – Committee Chair
San Francisco Police Department

Dennis Quijley – San Francisco PD
Mark Proia – San Francisco PD

Workshops & Armourer's Schools

Ron Nichols – Committee Chair
BATFE – Walnut Creek Laboratory

Howard Kong – ATF Walnut Creek Lab
Michelle Dilbeck – Alameda County Lab
Don Dunbar – CAL DOJ Chico
Kenton Wong – Forensic Analytical

Registration Desk

Eric Barloewen – Committee Chair
Santa Clara County DA's Laboratory

Brian Karp – Santa Clara County
Mark Bennett – Oakland PD
Lansing Lee – Oakland PD
Mike Appel – CAL DOJ Fresno
Sarah Yoshida – CAL DOJ Ripon
Ron Nies – CAL DOJ Redding

Golf Tournament

Joe Zorola – Forensic Technology, Inc.
Andy Smith – San Francisco PD

Technical Program

Andy Smith – Chair
San Francisco Police Department

Bruce Moran – Sacramento County Lab
John Murdock – ATF – Walnut Creek Lab
Nancy McCombs – CAL DOJ Fresno

Friends & Family Program

Chris Coleman – Committee Chair
Contra Costa County Sheriff's Office

Eric Collins – Contra Costa County
Terence Wong – Contra Costa County
Donnie Finley – Contra Costa County

Raffle / Door Prizes

Leslie Poole – Committee Chair
Sacramento County DA's Laboratory

Cara Gomes – Sacramento County Lab
Samantha Evans – CAL DOJ Santa Rosa

Additional Contributing Members

Audio - Visual
Mike Coakley – Prince George's County, MD

Webmaster
Scott Doyle – Kentucky State Police

Machinist / Technical Advisor
Mike Giusto – CAL DOJ Sacramento



Week at a Glance



Sunday, May 27th

The Presidio Golf Tournament (9:00 am – 6:00 pm)
Certification Examinations (8:00 am – 6:00 pm)
Wound Ballistics Workshop (9:00 am – 4:00 pm)
Sniper Investigation Workshop (9:00am–4:00pm)
Criteria for Identification Workshop (9:00 am – 4:00 pm)
Courtroom Testimony Skills Workshop (9:00 am – 4:00 pm)
Early Registration (11 am – 6 pm)
Welcome Reception (6 pm – 8 pm)

Monday, May 28th

Registration (7 am – 9 am)
Opening Ceremonies (8:00 am – 9:00 am)
Technical Session (9:00 am – 11:30 am)
Lunch (*provided*)
Business Meeting (1:00 pm – 5:00 pm)
Hi-Point Familiarization Course (6:00 pm – 9:00 pm)
Wound Ballistics Workshop (6:00 pm – 9:00 pm)

Tuesday, May 29th

Registration (7 am – 9 am)
Technical Session (8:00 am – 11:40 am)
Lunch (*on your own*)
Technical Session (1:00 pm – 5:20 pm)
Toolmarks in Bone Workshop (6:00 pm – 9:00 pm)
ISO Standards Workshop (6:00 pm – 9:00 pm)
Digital Photography Workshop (6:00 pm – 9:00 pm)
High Security Locks Workshop (6:00 pm – 9:00 pm)

Wednesday, May 30th

Registration (7 am – 9 am)
Technical Session (8:00 am – 11:30 am)
Lunch (*on your own*)
Technical Session (1:00 pm – 5:10 pm)
Serial Number Restoration Workshop (6:00 pm – 9:00 pm)
Silencer Design Workshop (6:00 pm – 9:00 pm)
Critical Incident Stress Mgt Workshop (6:00 pm – 9:00 pm)

Thursday, May 31st

Registration (7 am – 9 am)
Technical Session (8:00 am – 11:20 am)
Lunch (*on your own*)
Technical Session (12:50 pm – 4:05 pm)
Pre-banquet reception (6:00 pm – 7:00 pm)
Banquet (7:00 pm – 10:00 pm)

Friday, June 1st

Criteria for Identification Workshop (8:00 am – 5:00 pm)
Sniper Investigation Workshop (8:00 am – 5:00 pm)
Full Auto Conversions Workshop (8:00 am – 5:00 pm)
TASER / Less Than Lethal Workshop (8:00 am – 5:00 pm)
Sig Arms Armorer's Course (8:00 am – 5:00 pm)
AFTE 2007 Concludes (5:00 pm)



Sunday, May 27th



Schedule of Examinations, Workshops, and Events

<u>Time</u>	<u>Description</u>	<u>Location</u>
8:00 AM - 11:00 AM	Certification – Firearms Written Test	Golden Gate Room
8:45 AM	Depart for Presidio Golf Tournament	Hotel Entrance
9:00 AM - 5:00 PM	Scientifically Defensible Criteria for Identification	Marina Room
9:00 AM - 5:00 PM	The Investigation of Sniper Cases, Long Distance Shootings and Bullets Falling From the Sky	Seacliff A
9:00AM - 5:00 PM	Surviving and Thriving in the Courtroom	Seacliff B
9:00 PM - 5:00 PM	Wound Ballistics	Seacliff C & D
12:00 PM - 3:00 PM	Certification – Toolmark Written Test	Golden Gate Room
3:00 PM - 6:00 PM	Certification – Gunshot Residue Written Test	Golden Gate Room
11:00 AM - 6:00 PM	Early Registration	Grand Foyer
6:00 PM - 8:00 PM	Welcome Reception Sponsored by: San Francisco Police Department Hyatt Regency Forensic Technology WAI Inc.	Atrium 3 & 4



Monday, May 28th



Moderator: John Sanchez

Technical Session: Grand Ballroom A

- 7:00 AM** Registration
- 8:00 AM** **Opening Ceremonies**
Welcome – Loren Sugarman – AFTE President
John Sanchez – Chair – Finance and Registration
- Key Note Speaker**– Morris Tabak – Deputy Chief of Investigations – San Francisco PD
- 9:00 AM** **What's New in Ammunition**
George Kass – Forensic Ammunition – Okemos, Michigan
- 9:20 AM** **What is That Aluminum Thing I Got at Registration?**
Evan Thompson
- 9:25 AM** **The Identification of Consecutively Rifled 9mm Pistol Barrels – A Pre-Publication Update**
Jim Hamby – International Forensic Science Laboratory – Indianapolis, Indiana
- 9:30 AM** **BREAK**
Held in Vendor / Exhibitor Area – Grand Ballroom B & C
- 10:00 AM** **NFSTC – AFTE Media Based Training Program**
Dr. Katy Savage – National Forensic Science Training Center – Largo, FL
- 10:20 AM** **A Request for Participation in a Fracture Matching Validation Study**
Ann Davis – Virginia Department of Forensic Science – Richmond, VA
- 10:30 AM** **Words We Use and What They Tell Us About Our Thinking**
Lucien C. Haag – Forensic Science Services, Inc. – Carefree, AZ
- 10:40 AM** **Tales From the Bench: Techniques, Materials, and Discoveries**
Charles M. Clow – SW Institute of Forensic Sciences – Dallas, TX
- 11:05 AM** **AFTE 2008**
Curtis Kubo – Honolulu Police Department – Hawaii
- 11:20 AM** **DOOR PRIZE DRAWINGS**
- 11:30 AM** **LUNCH** – Atrium 3 & 4 at the hotel lobby level
- 1:00 PM** **AFTE Business Meeting**
- 5:00 PM** **END OF DAILY TECHNICAL PROGRAM**



Monday, May 28th



Evening Schedule

<u>Time</u>	<u>Workshop / Armorer's Course</u>	<u>Location</u>
6:00 PM - 9:00 PM	Hi-Point Familiarization Course	Seacliff B
6:00 PM - 9:00 PM	Wound Ballistics	Seacliff C & D



Tuesday, May 29th



Morning Moderator: Andy Smith
Afternoon Moderator: Bruce Moran

Technical Session: Grand Ballroom A

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|----------|--|
| 7:00 AM | Registration |
| 8:00 AM | General Announcements
AFTE 2007 Committee Member |
| 8:05 AM | 3D Cartridge Case Update
Serge Levesque – Forensic Technologies Inc. - Canada |
| 8:20 AM | Rethinking Our Defense of Firearm / Toolmark Identification
Diana Paul – Los Angeles Police Department – Los Angeles, CA |
| 8:45 AM | Taking a Stand on Daubert!
<i>Daubert Acceptability Criteria: Testability and Error Rate</i>
Ron Nichols – BATFE Forensic Laboratory – Walnut Creek, CA |
| 9:10 AM | Taking a Stand on Daubert!
<i>Daubert Acceptability Criteria: Relevant Scientific Community & Maintenance of Standards and Control</i>
Ann Davis – Virginia Department of Forensic Science – Richmond, VA |
| 9:35 AM | BREAK
Held in Vendor / Exhibitor Area – Grand Ballroom B & C |
| 10:00 AM | DOOR PRIZE DRAWINGS |
| 10:10 AM | Taking a Stand on Daubert!
<i>Daubert Acceptability Criteria: Peer Review</i>
Dom Denio – Federal Bureau of Investigation – Quantico, VA |
| 10:25 AM | Taking a stand on Daubert!
<i>A Daubert Hearing in San Francisco – How it All Comes Together</i>
Andy Smith, M.S. – San Francisco Police Department – San Francisco, CA |
| 10:50 AM | Command and Control on the Witness Stand: Employing the Principles of the OODA Loop
Raymond Davis – CourtSkills – Eagle, ID |
| 11:15 AM | Submachine Guns and Assault Rifles Used by ETA
Serge Martin - Institut National de Police Scientifique - Laboratoire de Toulouse - France |
| 11:40 AM | LUNCH (<i>on your own</i>) |
| 1:00 PM | DOOR PRIZE DRAWINGS |
| 1:10 PM | Effects of Fire Damage on the Ability to Make Identifications: Truck Burn Part III
Kristin Gerber & Jodi Marsanopoli – BATFE Forensic Laboratory – Ammendale, MD |



Tuesday, May 29th



- 1:35 PM** **National Firearms Examiner Academy – Update**
Jodi Marsanopoli – BATFE Forensic Laboratory – Ammendale, MD
- 1:45 PM** **Hammer Forging of Rifle Barrels: Individuality of Barrels Forged from a Single Mandrel**
Randall Stone – Las Vegas PD Crime Laboratory – Las Vegas, NV
- 2:10 PM** **Investment Casting in Barrel Manufacture of the Thunder Five**
Julianna Price – Virginia Department of Forensic Science – Norfolk, VA
- 2:35 PM** **BREAK**
Held in the Vendor / Exhibitor Area – Grand Ballroom B & C
- 3:00 PM** **DOOR PRIZE DRAWINGS**
- 3:10 PM** **Subclass Characteristics: Problem or Solution?**
Beta Tam – Los Angeles Police Department – Los Angeles, CA
- 3:45 PM** **The ENFSI Proficiency Testing Program on Identification of GSR by SEM/EDX**
Ludwig Niewohner - Forensic Science Institute of the Bundeskriminalamt (BKA) – Germany
- 4:15 PM** **FAID 2005 – Proficiency Test or Collaborative Study of Firearms Identification**
Petra Pauw-Vugts – Netherlands Forensic Institute – Den Haag, Netherlands
- 4:55 PM** **Class and Individual Characteristics on Primers of Expended Cartridge Cases**
Tsuneo Uchiyama – National Research Institute of Police Science – Chiba, Japan
- 5:20 PM** **END OF DAILY TECHNICAL SESSION**

Evening Schedule

<u>Time</u>	<u>Workshop / Armorer's Course</u>	<u>Location</u>
6:00 PM - 9:00 PM	Introduction to Saw and Toolmarks in Bone: A Class Characteristics Approach	Seacliff A
6:00 PM - 9:00 PM	ISO Standards and Firearms and Tool Marks	Seacliff C & D
6:00 PM - 9:00 PM	Compromise of High Security Locks	Marina Room
6:00 PM - 9:00 PM	Digital Photography	Golden Gate Room



Wednesday, May 30th



Morning Moderator: Chris Coleman
Afternoon Moderator: Nancy McCombs

Technical Session: Grand Ballroom A

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|----------|--|
| 7:00 AM | Registration |
| 8:00 AM | General Announcements
AFTE 2007 Committee Member |
| 8:05 AM | Breech Face Castings: An Evaluation of Three Products
J. Justine Davis – Onondaga County Center for Forensic Science – Syracuse, NY |
| 8:20 AM | Modern Methods of Shooting Scene Documentation
Doreen Hudson – Los Angeles Police Department – Los Angeles, CA
Tony Grissm – Public Safety & Forensics Account Manager – Leica Geosystems |
| 8:50 AM | Matching Cast Bullets to the Moulds that Made Them and Comparisons of Consecutively Manufactured Bullet Molds
Lucien C. Haag – Forensic Science Services Inc. – Carefree, AZ |
| 9:10 AM | Who Killed Sammy Weaver at Ruby Ridge?
Lucien C. Haag – Forensic Science Services Inc. – Carefree, AZ |
| 9:30 AM | BREAK
Held in the Vendor / Exhibitor Area – Grand Ballroom B & C |
| 10:00 AM | DOOR PRIZE DRAWINGS |
| 10:10 AM | Firearm Recoil Dynamics: The Effect of Handgun Gripping on Bullet Velocity
Alexander Jason – ANITE Group – Pinole, CA |
| 10:30 AM | Drive by Shooting: To Dream the Impossible Dream
Alexander Jason – ANITE Group – Pinole, CA |
| 10:55 AM | Video of Four Ricochet Surfaces
Jim Roberts – Ventura County Sheriff's Forensic Laboratory – Ventura, CA |
| 11:10 AM | Glock Enhanced Bullet Identification System (EBIS) Barrels
Judy Chin & Benjamin Sampson – Centre of Forensic Sciences – Toronto, Canada |
| 11:30 AM | LUNCH (<i>on your own</i>) |
| 1:00 PM | DOOR PRIZE DRAWINGS |
| 1:10 PM | Headstamp Impressions in Breech Face Residues
David Lane – Arizona Department of Public Safety – Flagstaff, AZ |
| 1:40 PM | Shotgun Pellet Patterns: Pellet Distribution and the Effect of Pellet Deformation
Kevan Walsh – ESR – Auckland, New Zealand |



Wednesday, May 30th



2:05 PM	The Identification of Impressed Cartridge Case Crimp Marks on Fired Bullets in a Casework Application Michael Barnes – California Department of Justice – Redding, CA
2:30 PM	BREAK Held in Vendor / Exhibitor Area – Grand Ballroom B & C
3:00 PM	DOOR PRIZE DRAWINGS
3:10 PM	WEB Databases for the Firearms Examiner Ruprecht Nennstiel - Bundeskriminalamt (BKA) – Germany
3:40 PM	Santa Ana Case Study Rocky Edwards – Santa Ana Police Department – Santa Ana, CA
4:15 PM	How to Check a Czech Michael Appel – California Department of Justice – Fresno, CA
4:30 PM	IPT – Identification of Production Toolmarks Lars Hebsgaard – Danish National Police Forensic Department – Copenhagen, Denmark
5:10 PM	END OF DAILY TECHNICAL SESSION

Evening Schedule

<u>Time</u>	<u>Workshop / Armorer's Course</u>	<u>Location</u>
6:00 PM - 9:00 PM	Serial Number Restorations – Magnaflux ®	Seacliff A
6:00 PM - 9:00 PM	Silencer Design	Seacliff C
6:00 PM - 9:00 PM	Critical Incident Stress Management	Seacliff D



Thursday, May 31st



Morning Moderator: Lansing Lee
Afternoon Moderator: Eric Collins

Technical Session: Grand Ballroom A

7:00 AM	Registration
8:00 AM	General Announcements AFTE 2007 Committee Member
8:05 AM	Stereoscopic 3D High Speed Video Axel Manthei – Bavarian State Bureau of Investigation – Munich, Germany
8:20 AM	Validation Study: Impressed and Striated Breech Face Marks Zachary Carr – Kansas Bureau of Investigation – Topeka, KS
8:45 AM	Assault Weapons and the Firearms Examiner Richard Maruoka – Los Angeles Police Department – Los Angeles, CA
9:20 AM	BREAK Held in the Vendor / Exhibitor Area – Grand Ballroom B & C
9:50 AM	DOOR PRIZE DRAWINGS
10:00 AM	How Much Can We Teach Microscopic Comparison in a Class Room? Beta Tam – Los Angeles Police Department – Los Angeles, CA
10:40 AM	2007 SWGGUN Overview Brandon N. Giroux – Federal Bureau of Investigation – Quantico, VA Charles Clow – SW Institute of Forensic Sciences – Dallas, TX
11:20 AM	LUNCH (<i>on your own</i>)
12:50 PM	DOOR PRIZE DRAWINGS
1:00 PM	The Statistical Significance of a Bullet Match David G. Howitt – University of California, Department of Forensic Science – Davis, CA
1:25 PM	A Comprehensive Statistical Analysis of Striated Tool Mark Examination Michael Neel – BATFE Forensic Laboratory – Atlanta, GA
1:50 PM	Statistical Analysis of Toolmark Striations Jeremy Craft – Iowa State University, Department of Statistics – Ames, IA
2:15 PM	Decay Factor Tests for the Production of NIST SRM 2461 Standard Casings John Song – National Institute of Standards and Technology – Gaithersburg, MD
2:35 PM	7th Inning Stretch Break!



Thursday, May 31st



2:40 PM	Long Distance Shootings – A Case Example Jan De Ceuster - Nationaal Instituut voor Criminalistiek en Criminologie – Belgium
3:00 PM	Assessment of Comparison Macroscopic Optical Resolution Based on Instrument Age Wayne Buttermore – Leica Microsystems – Bannockburn, IL
3:25 PM	17 and 22 Caliber Cartridge Interchangeability Justin Rankin – Kansas Bureau of Investigation – Kansas City, KS
3:50 PM	Micro-Marked Firing Pins: Character Durability and Micro-Mark Legibility Michael Beddow - University of California, Department of Forensic Science – Davis, CA
4:05 PM	END OF DAILY TECHNICAL SESSION

Evening Schedule

<u>Time</u>	<u>Event</u>	<u>Location</u>
6:00 PM - 7:00 PM	AFTE 2007 Pre-Banquet Reception	Grand Foyer
7:00 PM - 10:00 PM	AFTE 2007 Banquet Dinner	Grand Ballroom A



Friday, June 1st



Schedule of Workshops / Armorer's Courses

<u>Time</u>	<u>Description</u>	<u>Location</u>
8:00 AM - 5:00 PM	Scientifically Defensible Criteria for Identification	Marina Room
8:00 AM - 5:00 PM	The Investigation of Sniper Cases, Long Distance Shootings and Bullets Falling From the Sky	Seacliff A
8:00AM - 5:00 PM	Sig Arms / Sig Sauer Armorer's Course	Seacliff B
8:00 AM - 5:00 PM	Full Auto Conversion	Seacliff C
8:00 AM - 5:00 PM	TASER / Less Than Lethal Weapon Systems	Seacliff D
5:00 PM	CONCLUSION OF AFTE 2007	



Abstracts



What's New in Ammunition

- **George Kass**
Forensic Ammunition Service – Okemos, Michigan

To advise on what new ammunition is available on the commercial market as well as cover ammunition identification.

What is That Aluminium Thing I Got at Registration?

- **Evan Thompson**

This presentation is designed to inform the attendee what purpose the aluminium strip that he/she received at registration serves. This presentation will also inform the attendee on the machining process in manufacturing the aluminium strips.

Evan Thompson is the AFTE member who arranged for these items to be made and donated his time and energy in preparing them for distribution at the AFTE 2007 conference.



Abstracts



The Identification of Consecutively Rifled 9mm Pistol Barrels – A Pre-Publication Update

➤ **Jim Hamby**

Laboratory Director, International Forensic Science Laboratory & Training Center –
Indianapolis, Indiana

➤ **David J. Brundage, M.S.**

Senior Forensic Scientist, Indianapolis-Marion County Forensic Services Agency –
Indianapolis, Indiana

To date over 420 examiners (including the original 67 participants from Brundage's initial study) from 15 countries have completed the examination of bullets – knowns and unknowns – fired from ten consecutively rifled Ruger P-85 pistol barrels. In addition to examiners examining the bullets using conventional comparison microscopy, the bullets were also examined using SYCLOPS, ALIS, ISBIS, and FTI's new BulletTRAX-3D ®

This update is provided pending submission of the data to our AFTE Journal for consideration of publication by mid-summer. An error rate was developed as part of the research project and will be included with the submitted data.



Abstracts



NFSTC – AFTE Media Based Training Program

➤ **Dr. Katy Savage**

Training Program Manager, National Forensic Science Training Center (NFSTC) – Largo, FL

AFTE and the NFSTC have been working together to develop and produce a media based training CD to complement and enhance the existing AFTE training materials.

The use of a technology-based training (TBT) approach offers an engaging format to capture attention and to increase trainee comprehension. It is anticipated that this approach will streamline and standardize the training of firearms examiners, thus allowing for the effective allocation of available funds to reach the maximum number of interested parties.

The purpose of this presentation is to provide an update to the membership on the progress of the material and present a beta version.

Some additional information will also be provided regarding the NFSTC and products of use to the AFTE membership and their laboratories.



Abstracts



A Request for Participation in a Fracture Matching Validation Study

- **Lauren K. Claytor, B.S.**
Virginia Commonwealth University – Richmond, Virginia
- **Ann L. Davis, M.S.**
Virginia Department of Forensic Science – Richmond, Virginia

An extensive comparison microscopic study has been conducted to test the validity of the science of 3-D fracture matching. In addition, to address the error rate prong of the Daubert standards, a series of proficiency tests was developed. Four hacksaw blades were used to develop fourteen tests, each with a randomly generated number of matches and randomly generated matching item numbers. Most tests were made from a single blade, each test was different, and each test was then validated. To date, we have a response rate of approximately 96% and received results for 13 out of the 14 tests and multiple results for some tests.

This presentation is being made to request assistance from the membership to participate in the proficiency testing program. A final paper will be submitted for publication after test results have been received to provide an error rate from a sufficient population of the relevant scientific community. Members are requested to contact one of the following individuals to participate:

Words We Use and What They Tell Us About Our Thinking

- **Lucien C. Haag**
Forensic Science Services – Carefree, Arizona

The words we use to describe our work, what we observed and what opinions we derived from these observations should be chosen with great care.

Our personal biases (we all have them) can quickly creep into our reports and testimony as evidenced by our choice of words.

This brief presentation will illustrate some examples of language this writer has observed and given much thought to over the years.

It is hoped that the attendees will do likewise and make every effort to craft their reports and testimony in a concise and objective manner in all their future efforts.



Abstracts



Tales from the Bench: Techniques, Materials and Discoveries

➤ **Charles M. Clow**

Southwestern Institute of Forensic Sciences – Dallas, Texas

In the spirit of disseminating information, this presentation will describe techniques, materials and discoveries that have been gained over the past three years while performing the duties of a Firearm & Toolmark Examiner.

Topics to be covered include:

- ❖ A Method of Reproducing Cartridge Case Marks
- ❖ An Update on the Storage of Cartilage in 10% Formalin Solution
- ❖ A New Source for Cellulose Acetate Butyrate (AKA Dip-Pak)
- ❖ Firing Pin Bounce
- ❖ Little Known Cycling Marks
- ❖ Hi-Point's Fluted Barrel?
- ❖ Air Soft Guns & Serious Bodily Injury

AFTE 2008

➤ **Curtis Kubo**

Honolulu Police Department – Honolulu, Hawaii

Aloha! We invite you to the 39th Annual Association of Firearm and Tool Mark Examiner Training Seminar.

This update will give attendees a preview into next years AFTE Conference in Honolulu, Hawaii.



Abstracts



3D Cartridge Case Research Update

- **Serge Levesque, PhD**
Forensic Technology WAI, Inc. – Quebec, Canada

FT implemented the DFF (Depth From Focus) acquisition technique in the latest version of BrassTRAX-3D without any hardware change. DFF is used to acquire and view the actual 3D topography of a cartridge case. We will describe every step involved in this technique and demonstrate how a 3D topography is obtained from a set of 2D images. DFF also generates a Best Focus breech face image where any feature is in focus, including the firing pin region. In turn, this improves the 2D visualization. Combining the 3D topography and the Best Focus image generated by DFF yields a highly realistic representation of the cartridge.



Abstracts



Rethinking our Defense of Firearm / Toolmark Identification

➤ **Diana Paul**

Los Angeles Police Department – Los Angeles, California

Objectives: (1) To suggest an approach to defending the science of firearm/toolmark identification that answers the most basic questions about the foundation of our field in a way that juries and attorneys can understand. (2) To show that “real” science supports firearm / toolmark identification, not just our own “biased” literature.

Methodology: Review of firearm / toolmark identification literature, metallurgy textbooks and consultation with a metallurgist.

Results: The scientific support for firearm / toolmark identification is overwhelming and is based on basic metallurgy. However, we have not addressed our underlying scientific presumptions in a convincing, straightforward way to people outside of our field.

Conclusions: While preparing for a Daubert hearing and trial, I developed an approach to defending the science of firearm / toolmark identification that differed from others I have read or seen presented at AFTE seminars and in classes. The material and information is not new or novel, however, my approach to the material may assist others in their defense of the field.



Abstracts



Taking a Stand on Daubert!

- ***Daubert Acceptability Criteria: Testability and Error Rate***
 - **Ron Nichols**
Bureau of Alcohol, Tobacco, Firearms, & Explosives – Walnut Creek, California
- ***Daubert Acceptability Criteria: Acceptability in the Relevant Scientific Community and Maintenance of Standards of Control***
 - **Ann L. Davis**
Virginia Department of Forensic Science – Richmond, Virginia
- ***Daubert Acceptability Criteria: Peer Review***
 - **Dominic Denio**
Federal Bureau of Investigation – Quantico, Virginia
- ***A Daubert Hearing in San Francisco – How it All Comes Together***
 - **Andy Smith, M.S.**
San Francisco Police Department – San Francisco, California

There has been a tremendous amount published and presented dealing with how the discipline of firearms and tool marks meets the various elements of *Daubert* including: 1) testability of the scientific principle using the scientific method, 2) known or potential error rate 3) the existence and maintenance of standards of control, 4) peer review and publication, and 5) general acceptance in the relevant scientific community. This series of discussions will focus on *Daubert* principles in action. Each of the presenters will highlight particular prongs of *Daubert* and offer particularly relevant questions and responses to aid the audience in evaluating their own typical responses with regard to these issues. The presentation will conclude with a discussion of the most recent *Daubert* hearing in San Francisco.

It is important to remember that each testimony is an opportunity to educate and inform the criminal justice community of the scientific validity of the firearms and tool mark discipline and its application in the criminal justice community. It is hoped that this brief presentation will spur examiners to an introspective assessment of their own testimony and how improvement can be made.



Abstracts



Command and Control on the Witness Stand: Employing the Principles of the OODA Loop

- **Raymond J. Davis**
CourtSkills – Eagle, Idaho

The first part of the presentation will cover the principle elements contained in the OODA Loop developed by Colonel John Boyd. The acronym stands for Observe, Orient, Decide and Act. Boyd was an Air Force fighter pilot who developed air combat strategies for the US Military. Many of his contributions have been adapted throughout the military and used most notably in the first Gulf War. His talent for elucidating the steps required for obtaining and maintaining control in an adversarial/confrontational situation has also been used across all professional domains. The second part will cover how the OODA Loop functions to provide the expert witness with a high degree of command and control on the witness stand. The third part will cover examples from the author's experience of 1600 courtroom trials. Specifically, how the principles inherent in the OODA Loop reduced confrontations on cross examination, shortened time on the witness stand, increased juror appreciation while enhancing credibility as an expert witness.

Submachine Guns and Assault Rifles Used by ETA

- **Serge Martin**
Institut National de Police Scientifique – Laboratoire de Toulouse – France

This is a short presentation on the most common submachine guns and assault rifles used by the Basque terrorist movement (ETA). Special attention will be paid to the hand made or modified submachine guns. Further, the evolutions and tendencies of the ETA armaments will be discussed.



Abstracts



Effects of Fire Damage on the Ability to Make Identifications: The Truck Burn

Part III

- **Kristin A. Gerber**
Bureau of Alcohol, Tobacco, Firearms & Explosives – Ammendale, Maryland
- **Jodi E. Marsanopoli**
Bureau of Alcohol, Tobacco, Firearms & Explosives – Ammendale, Maryland

Objectives: The purpose of this research was to determine if identifications can be made with evidence recovered from a site that has been subjected to fire damage.

Methodology: This section of the project was conducted in conjunction with the ATF Fire Research Laboratory, which was attempting to reconstruct a crime scene in which a victim was found shot in a truck that was also burned. During the reconstruction, cartridge cases, bullets and a firearm were burned in a truck similar to the one found at the scene. Fired bullets were also inserted in a pig that was also burned in the truck in order to simulate the victim's death. The firearms evidence was collected from the truck and the pig. It was then examined and compared for identification purposes.

Results: The results showed that the some evidence recovered can be identified to a particular firearm, as well as to the other evidence collected.

Conclusions: It is possible to successfully identify ammunition components that have been fired from a gun prior to being burned in a fire. There are many factors that will affect the potential for identifications, including heat, changes to the surface of the firearm, rust formation, pitting of the barrel and breech and water damage to the firearm.

Results from Part II specifically related to the identification of the cartridge cases based on chamber marks will also be discussed.



Abstracts



BATFE National Firearms Examiner Academy Update and Overview

➤ **Jodi E. Marsanopoli**

Bureau of Alcohol, Tobacco, Firearms & Explosives – Ammendale, Maryland

This presentation will include an overview of the most recent Academy class, the graduates and a brief rundown about the upcoming class. The student selected by the NFEA Staff to represent the graduating class will be introduced.

Hammer Forging of Rifle Barrels: Individuality of Barrels Forged From a Single Mandrel

➤ **Randall D. Stone**

Las Vegas Metropolitan Police Department Forensic Laboratory – Las Vegas, Nevada

The use of hammer forging in the manufacture of gun barrels, popular in Europe for years, is now being used more frequently in the United States. This presentation provides a description of the process for the hammer forging of gun barrels and the manufacture of mandrels used in the hammer forging technique. In addition, this presentation documents research completed on the individuality of three rifle barrels that were hammer forged from a single mandrel and the criteria for identification used in this research. This study determined that barrels hammer forged from the same mandrel produce unique, reproducible and identifiable microscopic marks.



Abstracts



Investment Casting in Barrel Manufacture of the Thunder Five

➤ **Julianna Price**

Virginia Department of Forensic Science – Norfolk, Virginia

Objective: (1) Introduce the Thunder Five revolver. (2) Brief history of the company, Munitions International Laboratories Incorporated (MILI). (3) Give a detailed description of the manufacturing process of the Thunder Five, which consists mostly of investment casting. (4) Briefly discuss the effects investment cast rifling could have on the identification of fired bullets.

Methodology: The manufacturing facility of the Thunder Five was toured to observe how the rifling is investment cast into the barrel. While at the factory, two revolvers were test fired and 45 test fires were obtained from each firearm. Several specimens of barrels and frames from different stages of the manufacturing process were also obtained.

Results: Only a preliminary examination of the test fires has been conducted so far and further study would have to be performed to conclude whether or not investment cast rifling produces unique markings inside each barrel.

Conclusions: In general test fires from the Thunder Five have poor rifling and several have deformities. The concern for the firearms examiner is the fact that the rifling in the Thunder Five is produced by investment casting. Without any further research there is no way to know whether or not rifling that is investment cast has individual characteristics that will allow a firearm to be uniquely associated with a bullet fired through the barrel. It is possible that because each barrel is made by the same mold that similar microscopic features will be imparted on bullets fired through different barrels. But it is also possible that because of the way in which the ceramic mold is formed that the individual silicate grains could form a unique surface pattern on each mold which would then be imparted onto the steel poured in to make the final product. The finishing processes applied to the steel frame might also create a more unique surface inside the barrel.



Abstracts



Subclass Characteristics: Problem or Solution?

➤ **Beta Tam**

Los Angeles Police Department – Los Angeles, California

Outline of Objectives

Provide a different prospective for subclass characteristics, with a view to provide a systematic approach to avoid subclass influence to identification

Brief Methodology

- Discuss the definition of “Subclass Characteristics” as described in AFTE Glossary.
- Discuss that CMS stated that subclass characteristics are a problem and some examiners are reluctant to identify no gun cases due to the possibility of subclass characteristics.
- Explain the two types of subclasses:
 - (1) Matching tool marks generated by the machining process
 - (2) Matching tool marks generated by working tool
- Provide a different concept of generations of tool marks using:
 - (1) Screw driver – door knob - cast
 - (2) Cutting Tool – Breech face – cartridge case – photograph (digital images)
 - (3) Broach – barrel – bullet
- Explain how subclass characteristics are only a result of the upper generation tool marks.
- Provide examples of unique marks for identification using previous subclass papers.
- Introduction to **STRIA**, Source Tool Recognition Identification Approach, how to articulate tool marks observed on work pieces.
- Explain how to appreciate tool movement in order to tackle subclass characteristics.

Summary of Results

Subclass characteristics could be viewed as different generations of tool marks. Examiners have acquired the techniques through experience and now it has become a problem only because we did not get used to articulating tool mark formation and rule out the possibility of subclass.

General Conclusions

Subclass characteristics are very much like a phobia if you do not face it. Learn more about how tool marks are formed and prepare to articulate the formation of marks then you can explain how you eliminate subclass characteristics from your identification.

The ENFSI Proficiency Testing Programme on Identification of GSR by SEM/EDX

- **Ludwig Niewohner**
Forensic Science Institute of the Bundeskriminalamt (BKA) – Wiesbaden, Germany
- **J. Andrasko**
National Laboratory of Forensic Science – Linköping, Sweden
- **J. Biegstraaten**
Netherlands Forensic Institute – Den Haag, Netherlands
- **L. Gunaratnam**
National Bureau of Investigation – Vantaa, Finland

Introduction

Within the framework of the ENFSI Working Group "Firearms" a proficiency testing programme on the detection and identification of gunshot residues (GSR) by SEM/EDX was set up and performed [1, 2]. The latest test was carried out in 2005/06 (GSR2005). The test material was designed by the Bundeskriminalamt and manufactured on order by an external company for SEM accessories. The participating laboratories were requested to determine the total number of PbSbBa containing particles on the test samples following their own laboratory specific methods of automated GSR particle search and detection by SEM/EDX.

Sample description

The test items for the proficiency test consisted of a set of completely identical samples as it is demanded within the ISO 5725 standard for the performance of proficiency tests. Therefore the samples were produced using a special, patent protected method [3]. Synthetic "GSR particles" of a known composition of lead, barium, and antimony were precipitated onto a silicon substrate of a size of 8 x 8 mm². The total number of these synthetic GSR particles as well as their size and location on the sample have been well defined. Particle parameters concerning number and size were:

- 24 PbSbBa particles of 2.4 µm in diameter,
- 32 PbSbBa particles of 1.2 µm in diameter,
- 30 PbSbBa particles of 0.8 µm in diameter, and
- 14 PbSbBa particles of 0.7 µm in diameter.

Finally the samples were coated with a thin carbon layer and fixed on a standard 1/2" SEM stub. Before dispatch all samples were pre-examined by the organizer in order to guarantee an identical sample set for the test.

Although the test stubs do not represent "real case" GSR samples, this kind of sample material was chosen because it is considered to be the only way to facilitate the manufacture of really identical samples as demanded in proficiency testing.

Evaluation of data

All participating laboratories were requested to analyze the received sample using their standard GSR examination routines on their SEM/EDX systems, and to report the results within 4 weeks to the organisation committee. All reports had to include - among other analytical parameters - the number of detected PbSbBa particles, their size and their exact position on the sample. Sample evaluation was performed by comparing the received data with the original dataset of the sample production. An evaluation of the laboratory's performance to detect GSR particles by

SEM/EDX was carried out using z-scores according to IUPAC and EURACHEM [4, 5]. From all participating laboratories

- 90% detected at least 90% of the 2.4 μm particles,
- 80% detected at least 90% of the 1.2 μm particles,
- 69% detected at least 90% of the 0.8 μm particles, and
- 43% detected at least 90% of the 0.5 μm particles.

In order to estimate the overall quality of the SEM/EDX method in GSR investigation, the method's detection capability was determined. It describes the probability for a randomly selected laboratory to detect a particle of a certain particle size. In order to quantify the detection capability of the method with regard to the particle size, the probability of detection was modelled [2].

A comprehensive report on the results of the proficiency test was prepared and sent to all participants [6]. In 2007 a follow-up test will be launched (GSR2007), which has been appointed by ASCLD-LAB as an approved proficiency test [7].

The Proficiency Testing Programme is financially supported by the European Union (JLS/2006/AGIS/041).

References

- [1] Niewoehner L, Wenz W, Andrasko J, Beijer R, Gunaratnam L. "ENFSI proficiency test program on identification of GSR by SEM/EDX". J Forensic Sci 2003; 48(4): pp. 786-792.
- [2] Niewoehner L, Andrasko J, Biegstraaten J, Gunaratnam L, Steffen S, Uhlig S; "Maintenance of the ENFSI proficiency test program on identification of GSR by SEM/EDX (GSR2003)". J Forensic Sci 2005; 50(4): pp. 877-882.
- [3] Niewoehner L, Wenz HW, inventors. Niewoehner L, assignee. "Verfahren zur Herstellung synthetischer Partikelproben". Patent DE 199 32 357. 2001 Feb 8.
- [4] Thomson M., Wood R.; "The International Harmonized Protocol for the Proficiency Testing of (Chemical) Analytical Laboratories, (Technical Report)"; Pure Appl. Chem.; 65 (1993); pp. 2123-2144.
- [5] EURACHEM Guide on "Selection, Use and Interpretation of Proficiency Testing (PT) Schemes by Laboratories"; edition 1.0-2000; Internet: www.eurachem.bam.de .
- [6] "GSR2005 - Report on the International Proficiency Test on Identification of GSR by SEM/EDX"; private communication to all proficiency test participants; organization committee of the proficiency test; May. 2006.
- [7] <http://www.ascl-d-lab.org/legacy/asclablegacyapprovedproviders.html>; 06.01.2007; 11:30.



Abstracts



FAID 2005 – Proficiency Test or Collaborative Study of Firearm Identification

➤ **Petra Pauw-Vugts, BSc**

Netherlands Forensic Institute – Den Haag, Netherlands

Objectives: Within the ENFSI Expert Working Group Firearms a project group "Quality Assurance and Proficiency Testing, Firearms" started. The Bundeskriminalamt (Germany), Danish National Police (Denmark) and the Netherlands Forensic Institute are members of this project. The group created its first proficiency test for firearms identification: the FAID 2005.

Methodology: The FAID 2005 consists only of castings of bullets and cartridge cases, this way all participants have exactly the same marks to examine. The test contains fifteen sub-sets; each sub-set has two controls (test fires from known firearms, make, model and serial number given) and one unknown. Question for each sub-set is: "Is the unknown item from the same firearm as the two controls". This way a participant has to come to fifteen conclusions.

Results: The FAID 2005 had sixty participants, mostly European also American, Australian and African. All sixty sent in their results. After reviewing the results an extra questionnaire was sent to the participants concerning different properties of the test and more detailed information on the examiners participating in the test. The results were discussed at the closing meeting in Denmark, June 2006.

Conclusions: Results show not all participants of the FAID 2005 interpret found similarities or differences the same. This test should first be used as a collaborative study, to find ways to reduce differences in interpretation and have more (all) examiners use the same identification methodology.

Class and Individual Characteristics on Primers of Expended Cartridge Cases

➤ **Tsuneo Uchiyama**

National Research Institute of Police Science – Chiba, Japan

Objectives: Class characteristics are defined as measurable features of a specimen which indicate a restricted group source and it is usually used in estimating type and make of firearms that fired them. Discernible class characteristics on expended cartridge cases are such as; size and shape of firing pin of rimfire cartridge, size of firing pin aperture, relative position of the extractor and ejector. The FBI GRC file lists firing pin shape, position of extractor and ejector and breech face marking pattern as class characteristics on expended cartridge cases. The purpose of this study is to clarify whether the size and position of firing pin indentation and firing pin aperture marking of center fire cartridges are class characteristics or individual characteristics?

Methodology: NRIPS had taken digital photos of primers of test fired cartridge cases which were fired from handguns seized in Japan after 2000. The author measured the diameter of the firing pin indentation and firing pin aperture mark and eccentricity of both of them fired from caliber .25 and .32 semi-automatic pistols. The percentage value of firing pin indentation and firing pin aperture mark to diameter of primer pocket were grouped by each make of firearm. The percentage value of eccentricity of firing pin indentation and firing pin aperture mark to radius of primer pocket were also grouped by each make of firearm.

Results: Significant difference was observed between average values of diameter of firing pin indentation of various makes of semi-automatic pistols, such as those diameters of Beretta were small and those of Raven were large. However great variation was observed among these values on the cartridge cases fired from the same make of firearm. On the other hand, variation between the markings of two cartridges cases fired from the same firearm was small. Eccentricity of firing pin indentation and/or firing pin aperture marking fired from famous firearms, such as Beretta, Browning was not always small. Reproducibility of degree of primer protrusion between firing pin indentation and firing pin aperture marking was high among the cartridge cases fired from the same firearm. When the difference between the diameter of firing pin aperture and firing pin marking was large, the degree of protrusion became high.

Conclusions: Diameter and position of firing pin indentation and firing pin aperture marking is not only class characteristics but individually different characteristics. The range of value of diameter of firing pin and firing pin aperture is wide even among the same make of firearms. Wide variation was observed even on the cases fired from big-name guns because criminals fire a lot of cartridges because of their high reliability and the shape and/or surface of components would be changed a lot.



Abstracts



Breech Face Casting: An Evaluation of Three Products

➤ **J. Justine Davis**

Onondaga County Center for Forensic Sciences – Syracuse, New York

Casting can be used in firearms identification in both training and casework purposes for replication of various surfaces. Three different products available for casting will be evaluated. Mikrosil, Theftigate, and Forensic Sil. This presentation will focus on casting breech faces, and the pros and cons of each product.

Modern Methods of Shooting Scene Documentation

➤ **Doreen Hudson**

Los Angeles Police Department – Los Angeles, California

➤ **Tony Grissim**

Public Safety and Forensics Account Manager – Leica Geosystems

Objectives: Contrast the fundamentals of crime scene documentation with state of the art techniques currently available. A discussion of software programs, measuring devices and 3-D laser scanning technology that now support the field of crime scene reconstruction.

Methodology: A survey of specialized equipment used in a modern police agency including Photography, Sketching, Total Station survey equipment, 3-D modeling, animations and 3-D laser scanning.

Results: Examples of each type, in addition to a live demonstration of a 3-D Laser scanner will give the students a comprehensive overview of the advantages and tradeoffs of this low cost to high tech equipment.

Conclusions: Students will be able to make informed decisions about what type of system is best for the type of scene documentation needed in their respective jurisdictions.



Abstracts



Matching Cast Bullets to the Moulds that made them and Comparisons of Consecutively Manufactured Bullet Moulds

- **Lucien C. Haag**
Forensic Science Services – Carefree, Arizona

At least two articles have appeared in the *AFTE Journal* regarding the comparison of cast bullets with the mould that cast them. The authors [Kellet-July 1984 and Kreiser July 1995] come to opposite conclusions as to whether a cast bullet can be associated with a specific mould. One view is that such bullets can be associated with a specific, individual mould cavity while the other author cautions that you may only be able to say that a cast bullet came from one of a group of closely related moulds.

Following a brief illustrated description of the method used to manufacture bullet moulds and the various locations and sources of tool marks on these moulds, the author will demonstrate that both authors are right and that the correct interpretation of the tool marks on a cast bullet and any putative mould submitted for comparison require a firm understanding and recognition of class characteristics, subclass characteristics and individual characteristics.



Abstracts



Who Killed Sammy Weaver at Ruby Ridge?

➤ **Lucien C. Haag**

Forensic Science Services – Carefree, Arizona

During the initial shootout in August of 2002 at a place called the “Y” on Caribou Ridge, Randy Weaver’s son sustained two perforating gunshot wounds, one of which proved fatal. This wound was the consequence of a bullet that entered the boy’s back, perforated the heart and exited his chest. This bullet was never found during the original investigation and scene processing.

At the time of the criminal trial in the spring of 1993 the possible source of the fatal wound was one of two 5.56mm M16A2 rifles carried by two U.S. Marshals or a suppressed 9mm Colt SMG carried by a third U.S. Marshal.

The boy’s father, Randy Weaver was also nearby and fired a number of 9mm rounds into the air with a Tanfoglio TZ75 pistol.

A family friend of the Weavers also fired shots at the “Y” with a .30-’06 rifle but he and Randy Weaver were never seriously considered as the source of Sammy Weaver’s fatal wound.

The author opined in the 1993 criminal trial that the 5.56mm rifles were excluded as having fired the fatal shot and that a bullet from the 9mm SMG was the probable source of the boy’s fatal gunshot wound. This opinion was based on the nature of the bullet holes in the boy’s leather vest and underlying clothing and the limited choices of bullet types and calibers fired at the “Y”.

During the 1995 senate hearings on what came to be known as “The Siege at Ruby Ridge”, there was a suggestion that Randy Weaver accidentally shot his son with a stray bullet from one of his 9mm pistol shots. Working independently and out of a compelling desire to definitively know what happened on Ruby Ridge, Boundary County Sheriff Greg Sprungl and his close friend, Curt Kastens from the Idaho Department of Law Enforcement, conducted an exhaustive search of the field of fire at the initial shootout scene during the fall of 1995. They recovered numerous bullets after tracking their flight paths through the dense forest and undergrowth. Among these bullets was Sammy Weaver’s fatal bullet- a partially expanded 9mm SilverTip from the Colt 9mm SMG.

This presentation will show how this bullet was located and how it was association with the boy’s fatal gunshot wound through exterior, terminal and wound ballistics as well as trace evidence considerations.



Abstracts



Firearm Recoil Dynamics: The Effect of Handgun Gripping on Bullet Velocity

➤ **Alexander Jason**

ANITE Group – Pinole, California

The central question examines the belief that a bullet fired from a handgun held with a loose or “limp” grip will show a decrease in velocity. This paper presents the results of dynamic tests in which handguns were fired while unsupported and suspended allowing the handgun to recoil freely in a direction opposite to the bullet’s path and compares the resultant bullet velocities with those produced from a supported grip. A novel trigger activating device was utilized along with a Doppler ballistic radar system to demonstrate that the gripping of the firearm has no effect on bullet velocity.

Drive-By-Shooting: To Dream the Impossible Dream

➤ **Alexander Jason**

ANITE Group – Pinole, California

A woman is fatally shot while in the driver’s seat. Husband claims it was a drive-by shooting from an oncoming car. The primary question became: Is this possible?

A shooting incident analysis and reconstruction was performed using all available physical evidence and the integration of data from wound ballistics, velocity calculations, firearms performance, experimental video analysis, and 3D computer animation graphics. The analysis and reconstruction allowed a finding that the evidence was not consistent with the drive-by shooting scenario. This paper presents the methodology and analytical measures used.



Abstracts



Video of Four Ricochet Surfaces

➤ **James L. Roberts**

Ventura County Sheriff's Office Forensic Laboratory – Ventura, California

Objectives: The two experiments presented were designed to look at the actions of bullets during ricochet events. Shots were fired onto the surface of each of four media.

Methodology: This presentation uses high-speed video and still images taken at the Yuma Proving Ground to demonstrate bullet actions following ricochet from 4 different surfaces. The surfaces are concrete, wallboard, steel and asphalt. The cameras used are Redlake HG-100K cameras. One sequence also uses a high-speed Infer-Red camera by Indigo systems. One of each test will be presented though 3 shots were filmed of each.

Results: The presentation will allow the viewer to see for themselves what actions the bullets go through during ricochet. Including but not limited to the Yaw characteristics that occur.

Conclusions: As has been noted in literature on the subject bullets ricocheting from softer surfaces tend to go higher. Bullets off of hard surfaces tend to yaw nose down.



Abstracts



Glock Enhanced Bullet Identification System (EBIS) Barrels

➤ **Judy Chin**

Centre of Forensic Sciences – Toronto, Canada

➤ **Benjamin Sampson**

Centre of Forensic Sciences – Toronto, Canada

Objectives: To determine whether or not projectiles fired from EBIS barrels are of significant value for microscopic examination.

1. General description of manufacturing process
2. Methodology/materials
3. Examination and blind study
4. Results and conclusions

Methodology: Received four barrels and generated test fires using each barrel with a Glock, Model 22, .40 S&W caliber receiver and magazine from collection. Ammunition used: Winchester Ranger .40S&W, 180 gr. SXT and Winchester .40 S&W caliber, 155gr. FMJ truncated cone.

Compared test fires of both bullet profiles to one another within one barrel and against different barrels.

Blind study: scientist received known and unknown bullets to be microscopically compared to determine whether or not reproducibility of the rifling characteristics could be observed in the control samples and to determine whether or not the unknown samples could be identified to the correct barrel.



Abstracts



Headstamp Impressions in Breech Face Residues

➤ **David Lane**

Arizona Department of Public Safety – Flagstaff, Arizona

This research was conducted as a requirement for completing the 2006 National Firearms Examiner Academy and serves to raise awareness regarding headstamp impressions in breech face residues. Examples have been noted in casework in which soft residues have accumulated on a breech face and retain an impressed headstamp image of the last discharged cartridge. Firearms of various calibers were examined to determine the probability of residues accumulating, if headstamp impressions remained in the residue, and the effects of residues on breech marks. The results showed that .22 caliber rimfire firearms could have headstamp impressions remaining in residues. Along with firing pin impression orientation, these were useful in determining the last cartridge to be discharged. Hypothetical reconstruction scenarios are used to demonstrate how this finding may be useful in supporting or refuting witness accounts. On the other hand, centerfire calibers examined in this study were not likely to have accumulations of residues. When soft residues were applied directly to the breech there were not significant effects on centerfire primer breech marks.

Shotgun Pellet Patterns – Pellet Distribution and the Effect of Pellet Deformation

- **Kevan Walsh and Olivia Sampson**
ESR – Auckland, New Zealand
- **Olivia Samson**
ESR – Auckland, New Zealand
- **Moana Mackenzie**
LGC Forensics – Oxfordshire, UK

Objectives: As part of research carried out to reassess the methods used to estimate firing distance we explored some of the traditional beliefs regarding shotgun patterns. Two particular aspects that were investigated were;

1. The underlying statistical distribution of pellet patterns.
2. The effect of deformation of lead pellets on the pattern.

Methodology: (1) We undertook a study to test whether or not shotgun pellet patterns followed a Normal distribution. Shotshells were loaded with #4 lead pellets and fired over 10 and 15 meters. The Cartesian coordinates for each pellet hole in a pattern were recorded and Normal probability plots for each of the vertical and horizontal coordinates were plotted.

(2) It is popularly believed that the spread of shotgun pellets in flight is principally dictated by the differing aerodynamic effects upon individual pellets which have differing degrees of deformation imparted to them upon firing and through contact with the barrel. We explored this concept through a series of experiments involving loading coloured #4 lead pellets into the shotshell. Pellets in different locations in the shotshell were coloured differently. The pellets were fired vertically downwards over 15 meters into media such as water and gelatine to collect the pellets in a manner that did not damage them as a consequence of striking a solid target. The colour of each pellet and the Cartesian coordinates of the point at which it came to rest were recorded. The relative deformation of each pellet was also determined. The relationships between pellet deformation, pellet location in the shotshell and pellet location on the target were explored.

Results: (1) In general the vertical and horizontal coordinates were approximately Normally distributed. (2) A relationship was observed between the location of the pellet in the shotshell and the location on the target. The outermost pellets in the shotshell were the outermost pellets in the pattern. A relationship was observed between the location of the pellet in the shotshell and the resultant deformation of the pellet. The most deformed pellets were from the lower central core of pellets in the shotshell.

Conclusions: (1) This study supports the view that shotgun patterns have a bivariate Normal distribution. (2) This study did not show that there was any relationship between the degree of deformation of the pellets and their location on the target, which challenges traditional understanding of shotgun pellet distribution.



Abstracts



The Identification of Impressed Cartridge Case Crimp Marks on Fired Bullets in a Casework Application

➤ **Mike Barnes**

California Department of Justice, Bureau of Forensic Services – Redding, California

An example of the reconstructive value of identifying bullets to specific cartridge cases will be discussed. Previous research published in the literature indicates that unique characteristics are imparted on a bullet by the case mouth with Winchester ammunition. Two Winchester bullets, each with a cannellure, and each damaged by striking a separate participant in a shooting incident, were examined and compared to cartridge cases located in separate chambers of a recovered revolver. Assuming certain facts, the sequence of firing could be established. The theory of an attempted murder and then suicide was not supported by this examination. The technique for producing test toolmarks, agreement observed during the comparisons and consideration of subclass influence during the comparison process will be presented

WEB Databases for the Firearms Examiner

➤ Ruprecht Nennstiel

Bundeskriminalamt (BKA) – Wiesbaden, Germany

Objectives: Since the beginning of 2007, 3 new WEB databases are available via the Internet for the firearms examiner:

- ❖ **MoF** (Markings on Firearms): a database to determine the meaning of a marking found on a gun, including the possibility to post unknown markings to the community
- ❖ **FIRETYDE** (Firearms Type (=Class) Determination): a database to determine make and model of a firearm from marks found on fired bullets and cases. This database includes graphs of the typical appearance of marks as they appear on fired cartridges.
- ❖ **CALIBER**: a database to determine the caliber of a cartridge case from simple measurements, including the possibility to determine a standardized caliber name.

Methodology: All databases are available through the Internet free of charge for registered users only. The databases will be administered by the BKA. Forensic Science Department. Firearm labs all over the world are invited to become registered users.

Results: The presentation gives an "online" demonstration of the databases. Printed application forms will be distributed for the interested audience. Application forms, however, are also available at <https://www.forensic-firearms.bund.de>

Select > Login > User Registration

(Remark: don't forget to enter https as part of the address into your browser!)

Conclusions: The new WEB databases hopefully may prove to be useful working tools for the forensic firearms examiner.



Abstracts



Santa Ana Case Study

➤ **Rocky Edwards**

Santa Ana Police Department – Santa Ana, California

Objectives: Discussion of the Santa Ana Case Study

- Background
- Problems dealing with overwhelming shooting incidents
- Unique steps taken to deal with those issues
- Techniques resulting in tremendous success using the IBIS System
- Significant increase in IBIS Hits
- Better understanding of what the IBIS Hits mean

Methodology: The city of Santa Ana, California is about 24 square miles in diameter with over 100 active Hispanic and Asian Gangs. With over 2500 firearm related incidents, the Santa Ana Police Department's one Firearms Examiner and two part time assistants had to come up with unique techniques to help combat the odds in dealing with this situation. These techniques such as Expedited Report Writing, Flow Charting, Mapping and Training of Crime Scene Personnel and the IBIS system have helped to prioritize the workload of the Forensic Firearms Section.

Results: What has resulted from the techniques mentioned, the Santa Ana Police Department currently has nearly 800 IBIS Cold Case Hits with 630 of those hits being in the past 24 months. Because of the success of the program the coordination between the Firearms Unit and the Gang Unit has improved. The Gang Unit for the Santa Ana Police Department actually assigns cases to their detectives based on IBIS Hits.

Conclusions: These techniques and perspectives on report writing, flow charting, mapping techniques and procedures are presented as a way to show that things can be done to improve the effectiveness of the Firearms Unit. This is presented to the members in order to create innovative thinking toward ways to improve the industry and provide better results for the detectives and the communities they serve.



Abstracts



How to Check a Czech

➤ **Mike Appel**

California Department of Justice, Bureau of Forensic Services – Fresno, California

In casework, the firearm examiner may occasionally come across an unmarked or homemade firearm. Without a factory stamp indicating the caliber of the firearm, one must make these determinations by other means. This becomes even more crucial if test firing is requested. This paper will detail a particular homicide case involving an unmarked firearm and the steps taken and lessons learned to identify what cartridge(s) it was chambered for.

IPT – Identification of Production Toolmarks

➤ **Lars Hebsgaard, Detective Inspector**

Danish National Police Forensic Department – Copenhagen, Denmark

Objectives: New method which shows practicable production toolmarks inside cartridge cases.

Methodology: I will show, that in several steps of production, specific toolmarks will be left inside the cartridge cases from the tools / mandrels.

Results: By examining different makes of ammunition, the study has shown that the majority of cartridges in a randomly chosen box of ammunition are produced by the same mandrel.

Conclusions: My study has shown that it is possible to link cartridges to the mandrel that have been used in the production.

Stereoscopic 3D High Speed Video

➤ **Axel Manthei**

Bavarian State Bureau of Investigation – Munich, Germany

Digital high speed cameras have become faster and faster in recent years. Two Shimadzu HPV 1 digital high speed cameras capable of 1,000.000 frames per second were available to the Kurzzeit company of Werner Mehl. This brought up the idea to produce stereoscopic 3D high speed videos of shotgun pellets and other projectiles in flight and upon impact on different material. Also the explosion of a revolver was captured in 3-D.

The digital high speed videos were produced with two simultaneously triggered Shimadzu high speed cameras. The illumination was achieved with special flashes. The complete triggering of the whole setup was done with a RTTS trigger system and a Kurzzeit chronograph. Both videos were merged with special software to produce anaglyph images to provide a stereoscopic 3D effect. This effect is commonly known from 3D movie theaters. For viewing the videos the typical 2 color glasses are necessary.

The goal to produce 3-D high speed videos of ballistic incidents was achieved. The critical task is to (at the right moment) trigger and synchronize both cameras and the flashes within up to 1/1.000.000 of a second. This was possible with the equipment.

The stereoscopic effect enables the viewer to get a 3 dimensional impression of the particle movement and the dispersion of fragments. The understanding of the high speed dynamics involved is improved.



Abstracts



Validation Study: Impressed and Striated Breech Face Marks

➤ **Zachary Carr**

Kansas Bureau of Investigation – Topeka Kansas

Objectives: The AFTE Glossary states that: “The theory of identification as it pertains to the comparison of toolmarks enables opinions of common origin to be made when the unique surface contours of two toolmarks are in ‘sufficient agreement.’” This study was designed and conducted in a way to test the long held theory that fired cartridge cases originating from different firearms vary sufficiently in individual characteristics to the point where incorrect identifications and incorrect eliminations occur at a very low rate. This study was designed as a validity test to be completed by fully trained firearms examiners on a wide scale, throughout the discipline, to obtain a large enough sample population to provide substantial results.

Methodology: Twenty double blind sample sets were created to be sent to fully trained examiners across the United States. These sample sets consisted of a series of questions and knowns that originated from a pool of firearms. Isolated concentration on breech face marks was desired; to facilitate this, many parts that typically create identifying marks were kept constant. Great care was taken to anonymously send the sample sets to firearm examiners across the nation along with an equally anonymous method of reporting the conclusions. Each examiner was asked to record his/her results for the examination of each unknown in the sample set to include typical results of identification, elimination and inconclusive results when compared to the knowns; as well as inter-comparisons within the pool of unknowns when necessary.

Results: To be determined before AFTE 2007.

Conclusions: To be determined before AFTE 2007.



Abstracts



Assault Weapons and the Firearm Examiner

➤ **Richard K. Maruoka**

Los Angeles Police Department – Los Angeles, California

What happens when politics, the law, and forensic science mix? This is a relatively common occurrence, but when it involves firearms, the task of identifying specific types based on manufacturer, model, or even physical characteristics, the resulting outcome may be daunting for even the most experienced analyst.

This anecdotal paper will go into detail on the 18 year history of Assault Weapons Laws in the State of California, what it has attempted to regulate, issues it has raised, examples involving various types of firearms and devices, the impact it has on the Firearm Examiner, and what you may need to consider if your jurisdiction is planning to enact such legislation.



Abstracts



How Much Can We Teach Microscopic Comparison in a Class Room?

➤ **Beta Tam**

Los Angeles Police Department – Los Angeles, California

Outline of Objectives

Give a general introduction to a more classroom orientated training approach for microscopic comparison.

Brief Methodology

- (1) Development Stage – Discussions with trainees about identifications through the use of Drugfire images.
- (2) Introductory Stage – Grouping the images together to form individual topics for classroom presentations. Examples of early classroom presentation include ad hoc power point presentation for manufacturing marks and variations in firing marks for trainees. Other materials include presentations of unusual case studies for technical meeting for working staff.
- (3) Practical & Developing Stage – Put together the training materials available for the trainees and started the classroom training program with practical exercises. Development cycles started when trainee asked specific questions that needed to address and good examples from their training exercise.
- (4) Testing of the system – The trainees' confidence could only be built up through both practical exercises. The confidence of the trainer in the trainees built up through reviewing the ability of the trainees to solve their practical exercises.

Summary of Results

In order to ensure the competency of the trainee, we used the competency test normally used for testing the competency of newly employed experienced firearms examiner. Four out of the five students passed the competency test. We learned from the experience and modified the exercise requirements to avoid reoccurrences.

General Conclusions

The classroom approach yielded good result so far and the students could acquire more visual exposure to microscopic comparisons. It is more cost effective as most of the time only one full time trainer is required for the training program. When the full training materials are developed, it would be a comprehensive and systematic training program.



Abstracts



2007 SWGGUN Overview

- **Brandon N. Giroux**
Federal Bureau of Investigation – Quantico, Virginia
- **Charles M. Clow**
Southwestern Institute of Forensic Sciences – Dallas, Texas

This is an informational update on the Scientific Working Group for Firearms and Toolmarks. The presentation include a brief history of the working group, current Board Members, objectives, committees, and the documents/guidelines approved and available for peer review.

Upon completion of the Overview, a more detailed look will be taken at one of the most recent SWGGUN products.

The Scientific Working Group for Firearms & Toolmarks (SWGGUN) has produced an Admissibility Resource Kit that is designed to assist Firearm & Toolmark Examiners for admissibility hearings related to the science of Firearm & Toolmark Identification.

This overview will familiarize examiners with the content of the kit which includes:

- 1) An Overview of the Admissibility Rules
- 2) A Foundational Overview of Firearm & Toolmark Identification
- 3) A Review of the Admissibility Elements
- 4) Court Rulings
- 5) Supporting and Opposing Viewpoints to Firearm & Toolmark Identification
- 6) Appendices that include a Glossary of Terms, Online Resources and Visual Aids

Recently a Power Point Presentation based on the material within the resource kit was developed. This presentation can be adapted to an examiner's specific needs and will be available for download under the Visual Aids section of the resource kit. This Power Point Presentation will be previewed.



Abstracts



The Statistical Significance of a Bullet Match

➤ **Dr. David G. Howitt**

University of California – Forensic Science Department – Davis, California

Objectives: A derivation of the probability for finding patterns of matching lines, such as consecutive lines on the surfaces of a bullet has been made. The derivation assumes that the lines are derived from random processes and the criterion for correspondence is that both lines must fall within the width of the resolution limit imposed by the microscope. The expression can be used to determine the probabilities for any type of matching sequence and can therefore be used to quantitatively predict the probability that any specific match between two bullets can be associated with the same firearm.

Methodology: The number of different ways that a sequence of n lines can be distributed over the Q locations is given by an expression of the form $W = Q!/n!(Q-n)!$. Given the number of random lines present on the surface of a land or groove impression this expression can be used to determine the total number of possible line sequences that they can form. The inverse of this being the likelihood that a particular sequence of lines will be found at random.

Results: The calculation of the probabilities for particular sequences of consecutive matching lines have been done and seem to match fairly well to the original data by Biasotti. According to this calculation if there are between 40 and 60 lines on the land impression the probability of a random matching doublet somewhere on the land surfaces of the bullet should be in the range from 0.23-0.45 and for a random triplet 0.006-0.011. For a match of five consecutive lines the likelihood is in the range from 1 in 50,000 to 1 in 83,000 and for six consecutive lines between 1 in 800,000 and 1 in 1.4 million.

Conclusions: It is possible to determine the probabilities for large numbers of consecutively matched lines on a bullet and to demonstrate that they are extremely unlikely to occur randomly. It is also possible to demonstrate the same sort of thing for any pattern of correspondence that extends over a distance greater than about a tenth of a millimeter on a land impression.



Abstracts



A Comprehensive Statistical Analysis of Striated Tool Mark Examination

➤ **Michael T. Neel**

Bureau of Alcohol, Tobacco, Firearms, & Explosives – Atlanta, Georgia

Objectives: The purpose of this paper is to quantify the difference between Known Matches (KM) and Known-Non Matches (KNM) and to determine if there is a statistically significant difference between the most conservative KM and the best observed KNM. This was done in an effort to assist examiners in their articulation of what constitutes a match and a known non-match.

Methodology: A variety of toolmark sources were utilized, including two-dimensional (2D) and three-dimensional (3D) toolmarks. In this research, over 4000 striated toolmark comparisons were examined for their Total Matching Lines (TML), Percent Matching Lines (%ML), and Consecutively Matching Striae (CMS).

Results: The microscopic comparisons were examined and tabulated to determine the probabilities of the observed CMS runs of various sizes. The statistical significance of the observations were determined using the Z-test.

Conclusions: Two dimensional and three dimensional Known Non-Matches (KNM) and Known Matches (KM) can be distinguished statistically even at the minimum criteria for identification as set forth by Biasotti and Murdock. There is a statistically significant difference between the CMS runs observed in the best KNM and the most conservative KM.



Abstracts



Statistical Analysis of Toolmark Striations

➤ **Jeremy Craft**

Iowa State University – Department of Statistics – Ames, Iowa

The objective of this study was to develop a statistical algorithm that would automatically and objectively compare quantitative data files obtained from toolmarks. The goal was to determine whether statistical validation could be given in support of toolmark examiner assertions, as a partial answer to questions raised by the Daubert decision.

Toolmarks were obtained from both sides of 50 sequentially manufactured screwdriver tips. The surface roughness of the toolmarks were measured using a stylus profilometer, producing a set of several thousand distinct data files. A computer program was developed using an internal verification and validation algorithm that employed a Mann-Whitney statistical analysis.

Results indicate that successful, non-ambiguous matching of two separate toolmarks is possible using the developed validation algorithm. Constraints on the association of a suspect tool to a particular toolmark require that test marks be made using the correct side of the tool and that the marks be made at similar angles.

These constraints are well known to toolmark examiners and have been known for many years. However, to our knowledge, this study presents the first totally quantitative, objective, statistical evidence in support of the expertise of toolmark examiners on this subject. As such it provides documentation as to the reliability and scientific nature of toolmark identifications.

Decay Factor Tests for the Production of NIST SRM 2461 Standard Casings

- **John Song**
National Institute of Standards and Technology (NIST) – Gaithersburg, Maryland
- **P. Rubert** – Rubert & CO Ltd. – United Kingdom
- **A. Zheng** – Engineering Student – National Institute of Standards and Technology
- **T. Vorborger** – Precision Engineering Division - NIST
- **M. Ols** – National Laboratory Center - BATFE

Outline of Objects:

The electro-formation technique is used for duplicating surface specimens. A master specimen is put into a tank with electrolytes to produce a negative replica on the surface of the master. By repeating the same process on the negative replica, a positive replica is duplicated with the same surface topography as the master specimen. NIST plans to use this technique for the production of SRM (standard reference material) standard casings to support ballistics measurements nationwide. In order to ensure that the SRM casings are produced with virtually the same surface topography including casing signatures of firing pin, breech face and ejector mark, it is necessary to test the decay factor of the duplication process, and design an optimum plan for the duplication of a large amount of SRM casings with maximum uniformity of surface topography.

Brief Methodology:

Two decay factors, called horizontal and vertical decay factor α and β , are defined and tested for this purpose. The horizontal decay factor α is defined for quantifying topography decay among specimens duplicated one after the other from the same negative replica. The vertical decay factor β is defined for quantifying topography decay among specimens produced from one generation to the next generation.

Summary of Results:

26 replica casings are duplicated from the same master casing provided by the National Laboratory Center of the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF). 17 casings are duplicated from the same negative replica, and are used for the tests of the horizontal decay factor α . Nine casings are the positive replicas of nine generations from the same master, and are used for the tests of the vertical decay factor β . The NIST topography measurement system is used for correlation measurements of surface topography. The topography differences are quantified by the cross-correlation function maximum CCF_{max} . Initial tests have shown that the electro-formation technique can duplicate replica casings with high fidelity of surface topography. Based on these tests, the horizontal and vertical decay factors are calculated as $\alpha = 0.016\%$ and $\beta = 0.086\%$.

General Conclusions:

Based on the horizontal and vertical decay factor, an optimum production plan is designed for the production of 256 SRM 2461 standard casings. It is expected that 256 SRM standard casings could be produced from the same master casing with CCF_{max} values higher than 95 %.

Long Distance Shootings – A Case Example

➤ Jan De Ceuster, PhD.

Nationaal Instituut voor Criminalistiek en Criminologie – Brussels, Belgium

Objectives: A case example of how to approach a long distance shooting is presented. Care has to be taken to exclude any other possibility: direct shots and bullets falling from the sky. To corroborate the long distance shooting, a number of clues and tools are given that will help to decide.

Methodology: The results of a partial bullet trajectory reconstruction at the scene are used to simulate the complete bullet path with existing software EBV4 and Sierra's Infinity-5. It is explained how this software can be applied to approach this problem and what useful information can be derived from this.

The bullet is examined with a microscope to look for any possible damage indicating a base first or tumbling bullet strike.

Corroborative test firings were executed, whenever necessary with downloaded ammunition, to examine the bullet's penetration/perforation capabilities. The bullet's velocity was tracked with a Weibel Doppler radar.

Results: The bullet trajectory and degree of wounding were grounds to reject a direct shooting.

Bullet damage examination learned that it struck nose first, which is usually not expected for a bullet falling from the sky.

The trajectory reconstruction gave values for the angle of departure and downrange velocity. It was checked with test firings that the downrange velocity was still sufficient to explain the observed damage and wounding.

Conclusions: In presumed long distance shootings all possibilities should be checked to exclude direct shots and bullets falling from the sky:

- What is the damage to the bullet and what is the damage to any intermediary objects and/or persons that were hit?
- What are the required velocities for penetration / perforation of the given bullet / target combination?
- Does the velocity drop while perforating a target changes at a lower downrange velocity?

The software that was used for the trajectory reconstruction gave a good indication for angle of departure and range. Between the 2 programs there is a minor difference in downrange velocities. The ballistic coefficient should be chosen with care as it has an important influence on the trajectory.

Assessment of Comparison Microscope Optical Resolution Based on Instrument

Age

- **Wayne A. Buttermore, B.A., MBA**
Leica Microsystems – Bannockburn, Illinois

Objective: To determine the resolution capabilities of current microscope technology as compared to earlier produced comparison microscope systems. Correlation to the theoretical limits as defined by calculated values are compared to observable resolution.

Method: Seventeen trained operators used a certified resolution test slide with reproducible illumination and magnifications, to determine the resolving capabilities on 16 different comparison microscopes systems ranging in age from less than 12 months to more than 30 years old.

Summary of Results: New Microscopes out performed older systems consistently, however, it does not prove that older microscopes are not capable of resolving structures that are typical of firearms and toolmark examinations:

General Conclusions: A variety of factors lead to the ability of a microscope system to resolve structures, including illumination, filtering, gender, age of the instrument, instrument maintenance, color of light, and visual acuity of the operator..



Abstracts



17 and 22 Caliber Cartridge Interchangeability

➤ **Justin Rankin**

Kansas Bureau of Investigation – Kansas City, Kansas

Objectives: (1) To determine the cartridge interchangeability between the 17 and 22 caliber families. (2) To study the effect of this interchangeability on physical and individual characteristics exhibited on fired bullets.

Methodology: Utilizing a Ruger Single Six revolver, test fires were obtained from combinations of 17 and 22 caliber cylinders/barrels. Various bullet materials were used in the test firing process. Microscopic examination was performed on the test fired bullets to determine if physical and/or individual characteristics were exhibited.

Results: The different 17 and 22 caliber cylinder/barrel combinations showed definite physical characteristics including increased length, decreased diameter, and unusual deformation in some cases.

Conclusions: (1) It is possible to fire 22 caliber bullets from a 17 caliber chambered cylinder and barrel with no modification to the firearm.

- 22 Short caliber cartridges can be loaded and fired in a cylinder chambered in 17 Mach 2.
- 22 Long Rifle caliber cartridges can be loaded and fired in a cylinder chambered for 17 HMR.

(2) The unique physical characteristics exhibited by the test fired bullets obtained from the cylinder / barrel combinations have the potential to aid examiners in the event that similar items are received in case work.

Micro-Marked Firing Pins: Character Durability and Micro-Mark Legibility

➤ **Michael T. Beddow**

University of California – Forensic Science Department – Davis, California

➤ **Frederick Tulleners, MA and David Howitt, PhD**

University of California – Forensic Science Department – Davis, California

The laser machining of microscopic encoding structures on specific firearm components has been proposed to assist in the identification of expended ammunition components found at crime scenes. Since the release of the first generation of this technology significant advances in the laser machining technology and in the encoding structures have been made. This study involved the testing of second generation firing pins produced by ID Dynamics, LLC. Second generation micro-marked firing pins contain three different forms of encoding: alphanumeric, gear and radial bar codes. The durability of these micro characters and legibility of their impressions were observed by the testing of eleven semi-automatic pistols, two semi-automatic rifles and a pump action shotgun on a variety of different ammunition brands. All cartridge cases were analyzed using a stereo zoom microscope equipped with a ring light and polarizing filter, and all firing pins were analyzed utilizing a Philips XL30 Scanning Electron Microscope.

The alphanumeric and gear code structures showed minimal signs of degradation with repeated test firing beyond 1000 rounds; however specific instances of degradation were noted. Eight of the eleven semi-automatic pistols tested showed severe degradation of the radial bar code structures. This degradation was caused by the continual contact between the sides of the firing pins and the firing pin aperture. This contact obliterated a section of the radial bar code structures. The applicability of the codes other than the alphanumeric could not be evaluated because decoding information was not available. This study suggests that the placement of an eight digit alphanumeric code on the face of the firing pin is the most durable. Any increase in the number of digits in this code would reduce the legibility of the impressions.

The legibility of the impressions produced by these micro-marked firing pins varied between firearms. Transfer rates were observed from zero to 100% for all encoding formats. All of the semi-automatic pistols and one semi-automatic rifle showed a minimal decrease in the legibility of the impressed characters with continued test firing. Three major factors affected the legibility of the impressed characters for each of the firearms tested: ammunition brand, firing pin drag, and multiple strikes of the firing pin within the same impression (all firearms tested did not produce firing pin drag and multiple firing pin strikes). The legibility of the impressed characters was directly dependent upon the brand of ammunition tested. This ammunition brand dependence was confirmed upon repeated test firing of each brand of ammunition. One semi-automatic rifle and the pump action shotgun showed a decreasing trend in impression legibility throughout test firing. This decrease in transfer rate was correlated with the degradation of the encoding structures on these two firing pins. This technology is currently not suitable for .22 caliber rimfire firearms.

At the present time this technology is feasible, but is not applicable to *all* firearms. Further research and development needs to be completed prior to the widespread commercial implementation of this technology.



Exhibitors



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Workshops & Armorer Schools



The Investigation of "Sniper" Cases, Long Distance Shootings and Bullets Falling From the Sky

Instructors: Luke and Mike Haag

Sniper cases are purposeful, premeditated acts of violence where the victims are generally selected and targeted but are seldom personally known to the shooter. The victims are simply targets of opportunity and this is one of the complicating factors in investigating and solving these crimes. The shot or shots are often fired from a selected area of concealment employing long guns and involve distances of fifty to several hundred yards. The various motives and the question of "why" for these shootings are for social scientists to answer. The 'who' and 'with what' and "from where" are the tasks of the forensic scientist and involve the characterization of the responsible firearm and ammunition, the location of the shooter's position and the possible linking of suspected "sniper" cases.

A second category is that of long distance shootings. These are usually the result of the careless discharge of a firearm (inadequate backstop, shooting over a hill or berm at a shooting range). Angles of departure in these cases are seldom in excess of +5 to +10 degrees but result in projectile flights of hundreds to as much as several thousand yards. The third category is that of so-called "falling bullets" from the reckless discharge of firearms at very high departure angles such as +30 degrees to vertical firings. These events are often associated with the celebratory discharge of firearms on holidays such as New Year's Eve and the 4th of July in the United States.

This 2-day workshop will address the special problems in processing and reconstructing these shooting scenes to include direction and range of fire estimates, trajectory reconstruction as well as ammunition evaluation and firearm assessment. Each participant will receive a syllabus and a current copy of Sierra Bullets Infinity 5 exterior ballistics program [Participants already in possession of this program should bring it with them]. This computer program will be demonstrated and used extensively during this workshop. Attendees are strongly encouraged to bring a laptop or notebook computer so they can gain firsthand experience with this ballistics program.

Scientifically Defensible Criteria for the Identification of Toolmarks

Instructors: Bruce Moran and John Murdock

This 2-day workshop will examine the scientific basis for the firearms and tool mark discipline. Each participant will receive a large collection of relevant references that will be useful in identifying critical scientific issues within the discipline and tools by which these concerns can be addressed in court. Participants will learn the role consecutive matching striations (CMS) has in the greater picture of the discipline and how CMS can be applied and interpreted in casework. Each participant will undergo extensive hands-on training in the utility and interpretation of CMS as it applies to striated tool marks.



Workshops & Armorer Schools



Wound Ballistics

Instructor: Dr. Besant-Matthews

This one and one-half day workshop will introduce many different aspects of wound pathology including blunt and sharp injury for purposes of terminology, examination and interpretation of gunshot wounds, and examination and interpretation of injuries by shotguns. Participants will also be introduced to guidelines for gunshot wound documentation and offered tools to assist in this task. Overall, this workshop will provide each participant with a better understanding of injuries and their interpretation and how this applies in a greater shooting reconstruction effort.

Surviving and Thriving in the Courtroom

Instructor: Raymond Davis

This one day course provides an overview of the skills necessary to survive and thrive in the courtroom. Although this class is primarily focused on the new or entry level analyst everyone can benefit from the information provided. Students are taught specific skills to improve their performance on the witness stand while maintaining a relaxed and attentive demeanor.

Hi-Point Familiarization Course

Instructor: Tom Deeb

This workshop will discuss the Hi Point product line as well as the assembly/disassembly, serial number system, and the manufacturing processes of Hi Point along with how to contact Hi Point for support with questions. Given by the owner of Hi Point, Mr. Deeb has been an avid supporter of law enforcement efforts and AFTE.

Digital Photography

Instructor: Wayne Buttermore

This half-day workshop will acquaint participants with various digital imaging techniques and applications for the firearm and tool mark discipline. As systems become more cost-effective and efficient it becomes increasingly valuable to be able to understand and learn how to apply digital imaging to firearm and tool mark casework and evidence. This will be a hands-on workshop and as such, registration will be limited.



Workshops & Armorer Schools



Introduction to Saw and Toolmarks on Bone: A Class Characteristics Approach

Instructor: Steve Symes

This half-day workshop will acquaint participants with the recognition and interpretation of tool marks, specifically those produced by saws, on bone. The workshop does not detail the identification of a particular saw to tool marks in bone but, rather, provides the participants with knowledge and skills to interpret and classify a range of tools that may have been responsible for producing the tool marks.

This hands-on workshop will introduce the participants to various techniques for measuring and interpreting class characteristic data present within the tool marks. Each group of participants will be provided with casts of genuine tool marks in bone along with the equipment necessary to evaluate the tool marks.

This project is supported by Award No. 2005-IJ-CX-K016, awarded by the National Institute of Justice, Office of Justice Programs, US Department of Justice. The opinions, findings and conclusions or recommendations expressed in this publication/program/exhibition are those of the authors and do not necessarily reflect the views of the Department of Justice. This research is also supported by the National Forensic Academy, and Forensic Sciences Foundation, American Academy of Forensic Sciences.

ISO Standards and Firearm and Tool Marks

Instructor: Larry Lorschach, ASCLD/LAB

This half-day workshop will be useful to those in laboratories beginning the process of moving from ASCLD/LAB Legacy standards to the ISO standards. Participants will be introduced to highlights in the ISO standards, the interpretation and implication of these standards as they apply to the firearms and tool mark discipline, and various ways in which these standards are being met. This workshop should be especially helpful in putting at ease much of the misinterpreted, anecdotal information about ISO that is spreading throughout laboratories nationwide.

Compromise of High Security Locks

Instructor: Marc Tobias, Security Systems

Manufacturers that sell high security locks with UL 437 OR ANSI ratings claim that they are highly resistant to covert methods of entry, but are they really in the high tech world of crime? This workshop will focus on the most popular high security locks in the United States: Medeco, Assa, Mul-T-Lock, and Schlage Primus and why some of the claims by certain manufacturers as to their security may not tell the entire story. The UL and ANSI standards will also be analyzed as to how they define high security and why these standards may not fully test for certain vulnerabilities. This workshop will be an extension of the one given by Marc Tobias in 2006 at Springfield on the threat posed by lock bumping.



Workshops & Armorer Schools



Serial Number Restorations – Magnaflux ®

Instructor: Walter Dandridge

This half-day workshop will introduce students to restoration of serial numbers using Magnaflux. Each participant will be acquainted with the background, technology and technique for this methodology.

Critical Incident Stress Management

Instructor: David Wee

This half-day workshop will introduce participants to the concept of critical incident stress management (CISM). One of the common, now archaic, techniques for dealing with stress related to critical incidents was to detach from them. It is becoming quite apparent that detachment, while immediately helpful, has a greater likelihood of deleterious long-term effects extending to all avenues of our lives. This workshop will help participants to be more aware of ways in which critical incident stress can be managed such that they are not paralyzed from accomplishing the task while maintaining long-term mental health that is vibrant.

David Wee, M.S.S.W., is employed by the City of Berkeley, Department of Health and Human Services, Mental Health Division, Mobile Crisis Team and Compliance Program. He serves as Program Supervisor of the Mobile Crisis Team, which provides consultation to emergency service personnel concerning emergency mental health intervention. He is also responsible for coordination of psychological support services to emergency services personnel and delivery of mental health services to citizens following disasters.

Silencer Design

Instructor: R. Vasquez, ATF

This half-day workshop will acquaint participants with various silencer designs, effectiveness, means of testing and legal implications. The most recent technology will be introduced and discussed.

Full-Auto Conversion

Instructor: R. Vasquez, ATF

This full-day workshop will acquaint participants with full auto conversions of semi-automatic firearms. This includes common means of conversion, how to recognize them, and legal implications. A wide-assortment of firearms will be presented and discussed. The instructor will have, on-hand, many examples that participants will be able to examine.



Workshops & Armorer Schools



Taser / Less Than Lethal Weapon Systems Workshop

Instructor: Rick Wyant and TASER Systems

This workshop will give the firearms examiner a baseline expertise of TASER and Less lethal evidence that may be encountered in casework. Topics to include in-custody death, excited delirium, evidence collection / analysis, data download, wound interpretation, and scene reconstruction. Students will handle and fire the M26, X26, and civilian TASERs. Students will also gain familiarity expertise in other less lethal options available on the market including 12 gauge, 40mm, grenade, and other delivery systems.

Sig Arms Armorers Course

Instructor: Nick Roberts, Sig Arms

The program content focuses on the mechanical functioning, maintenance, troubleshooting, and field repair of the SIG Sauer pistol line. This is a hands on program that teaches and guides each participant through all armorer operations, step by step with the instructor. Active participation in disassembly and assembly procedures coupled with question and answer periods provide the type of learning environment favorable for the retention of the material. Written and practical exams are administered to test the working knowledge of each participant. The curriculum enables armorers to develop a pistol maintenance program on the inspection and servicing of the SIG Sauer law enforcement pistols for their departments. Following successful program completion, certification / re-certification to perform these procedures is valid for a period of three (3) years. This is of major importance to the agency as it maintains current practices and procedures for factory authorized maintenance on law enforcement pistols within the department.

Overview

- An introduction to SIG Sauer pistols
- An examination of the SIG Sauer Safety System
- Disassembly and assembly procedures: slides, frames, magazines
- A thorough examination of all pistol operations
- Inspection procedures
- Troubleshooting
- Operational function checks
- Sights: installation, adjustment
- Alternative maintenance methods

Instructor

Nick Roberts is a Lt. with the Salt Lake County Sheriffs Office, in Utah. He has been the range master there for many years and teaches a wide variety of law enforcement and civilian firearms courses.



Special Appreciation



The host committee would like to thank and recognize the following individuals, departments, and businesses that have provided extraordinary support for this year's 38th Anniversary AFTE Training Seminar:

Alameda County Sheriff's Office

Armor Forensics

Bureau of Alcohol, Tobacco, Firearms, and Explosives – Walnut Creek

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California Department of Justice – Bureau of Forensic Services

- Chico Crime Laboratory
- Central Valley Crime Laboratory
- Fresno Crime Laboratory
- Redding Crime Laboratory
- Sacramento Crime Laboratory
- Santa Rosa Crime Laboratory

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Oakland Police Department

Sacramento County District Attorney's Forensic Science Laboratory

San Francisco Police Department

- Chief Heather Fong
- Deputy Chief Morris Tabak
- Dr. Cydne Holt – Director of Forensic Services Division
- James Mudge – Criminalistics Laboratory Manager

San Mateo County Sheriff's Forensic Laboratory

Santa Clara County District Attorney's Crime Laboratory

Steve Gore

Team Fabrication and Neil Hopkins



Contributors



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AMS and Steve Gore

Marshmallow Fun Company
www.marshmallowshooter.com

Armor Forensics

Mike Giusto

Bear Republic Brewing Company

Neil Hopkins, Team Fabrication

Bob Kennington

Oakland A's

Brownells

Otis Technology

Castagnola's Restaurant (located at
Fishermans Wharf-286 Jefferson Street)

Palomino Restaurant (located
across from Pier 22-345 Spear
Street)

Charles Meyers

Philip Hess

Christopher R. Bartocci

Precision Forensic Testing,
Chris Monturo

Clos du Bois Winery

River City Gun Exchange

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Royal Purple Ltd

Ferry Plaza Wine Merchant (located in the
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See's Candies

Forensic Ammunition, George Kass

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Tower Tours



Banquet Raffle Items



Donated By:**Item(s) Description:**

Armor Forensics:

Trajectory Kit

Bob Kennington:

9mm Matrix (4)
380 Auto Matrix (1)

Castsgnola's Restaurant:

\$100 Gift Certificate

Charles Meyers, Author:

Silent Evidence (2 copies)

Elsevier Publishing:

Crime Reconstruction by Chism and Turvey

Ferry Plaza Wine Merchant:

Wine tasting for 4

Forensic Ammunition:

\$500 toward purchase of software, or free
\$300 upgrade

George Wilson

Wilson Barrel Board

Handgun Press:

Soviet Russian Postwar Military Pistols and
Cartridges (2 copies)
The Navy Luger

Hornaday:

Bullet Display
Hornaday Handbook of Cartridge Reloading
(2 copies)

Lecia:

Lecia Stereoscope

Lucian Haag:

Shooting Incident Reconstruction

Mike Giusto:

Cut-away Firearms

Neil Hopkins,
Team Fabrications

Rifle or Shotgun

Oakland A's:

Two tickets to an A's game

Otis Technology:

Elite Cleaning System
Tactical Cleaning System (2)

Philip Hess:

Gurkha Cigars

Precision Forensic Testing,
Chris Monturo:

Instructional posters

Sierra Bullets:

Sierra Exterior Ballistics Software Package
(3)

Tom Deeb,
Hi-point Firearms:

Savage Rifle

Tower Tours:

Wine Country Tour for 2



Family and Friends Program



Monday, May 28th

Night Tour of Alcatraz

Out in the middle of San Francisco Bay, the island of Alcatraz is a world unto itself.

See the island that is one of Golden Gate National Recreation Area's most popular destinations, offering a close-up look at a historic and infamous federal prison long off-limits to the public. Visitors to the island cannot only explore the remnants of the prison, but can also learn about the Indian occupation of 1969 - 1971, early military fortifications (the first U.S. fort on the West Coast), and the West Coast's first (and oldest operating) lighthouse.

While a prison Alcatraz housed 1,545 inmates in 378 cells. Ninety Officers were required to cover the three 8-hour shifts guarding the prisoners. Famous prisoners that called Alcatraz home included: Al Capone, George "Machine Gun" Kelly, Robert "The Birdman" Stroud, and Alvin "Creepy" Karpis, the driver for notorious bank robbers Bonnie and Clyde. After serving as a prison for 59 years, Alcatraz was closed in 1963 and prisoners were moved to a new prison in Marion, Illinois.

Tuesday, May 29th

San Francisco City Tour

Highlights include:

- Chinatown
- Fisherman's Wharf
- Victorian Homes
- Golden Gate Park
- Palace of Fine Arts
- North Beach
- Presidio National Park
- Awe-inspiring views of Alcatraz, and the Pacific Ocean

Scheduled stops:

- Vista Point at Golden Gate Bridge
- Twin Peaks – breath-taking hilltop panoramic views of the City (weather permitting)
- Other stops and photo opportunities will be recommended by your tour guide



Family and Friends Program



Tuesday, May 29th

Oakland Athletics vs. Texas Rangers

Come see the American League West Champion **Oakland A's**

- Milton Bradley Bobble Head Day (First 15,000 fans)
- Seats are in section 124, field level behind the A's dugout on the third base side.
- McAfee Coliseum, home of the Oakland A's, Oakland Raiders, and Golden State Warriors.

Wednesday, May 30th

Napa Valley Wine Tour

Enjoy spectacular views as you drive through California's famous premium wine producing regions. You will tour and taste at each winery, as you learn how wine is made from start to finish.

The tour of Sonoma and Napa Valleys includes:

- Cross over both the Golden Gate and the Bay Bridges
- Tastings at **Kirkland Ranch Winery**, **Madonna Estate**, and **Viansa Winery**.
- Stroll, shop, lunch and relax at Vintage 1870, located in Napa Valley – a converted historic 130 year old winery with 36 Specialty Shops and Art Galleries.

Thursday, May 31st

Winchester Mystery House

In 1884, the Winchester rifle heiress Sarah Winchester began work on the 160 room Victorian. For 38 years she kept carpenters working 24 hours a day non-stop. The Mansion is filled with so many unexplained oddities, that it has come to be known as the "Winchester Mystery House".

See "The Gun that Won the West" in the Firearms Museum, one of the largest Winchester rifle collections on the West Coast. Also see the "Antique Products Museum," which has a rare collection of antique products once manufactured by the Winchester Company.

There will be a guided tour of the Mansion, and time to see the beautiful gardens and museums before returning to San Francisco.



Family and Friends Program



Getting Around San Francisco

San Francisco Municipal Railway (MUNI)

The San Francisco Municipal Railway (MUNI) is the 7th largest public transit system in the United States. MUNI has approximately 700,000 boardings on any average weekday. Its fleet of about 1,000 vehicles, over half of which are electric, consists of subway-surface-light-rail vehicles (Metro Streetcars), electric trolley buses, diesel buses, the world-famous cable cars, the only ones in the world still operating, and a unique collection of historic streetcars. The first publicly owned streetcar system in a major US city, MUNI has been taking the people of San Francisco where they want to go since 1912.

www.sfmuni.com

CITY PASS

Passports provide unlimited rides on all MUNI vehicles except special service (disabled). A cable car ride is normally \$5 one way. All other MUNI vehicles are \$1.50 one way.

- MUNI 7 Day Passport - \$24

www.sfmuni.com/cms/mms/fares/fareinfo.htm#passports

San Francisco CITY PASS - \$54

- Includes the following:
 - San Francisco Museum of Modern Art
 - Blue & Gold Fleet Bay Cruise
 - Exploratorium
 - De Young / Legion of Honor
 - MUNI & Cable Car 7-Day Passport
 - Aquarium of the Bay
 - And Your Choice Between:
 - California Academy of Sciences & Steinhart Aquarium
 - Asian Art Museum

www.citypass.com/city/sanfrancisco.html



Family and Friends Program



Websites for Visitor Information

Only in San Francisco

<http://onlyinsanfrancisco.com/>

SF Guide

<http://www.sfguide.com/>

San Francisco Chamber of Commerce Travel Guide

<http://www.sfchamber.dpway.com/sfchamber/search.aspx>

SF Gate Visitor's Guide

<http://www.sfgate.com/traveler/guide>