Bullet Recovery System

- Available in a 60" or 48" High Tank.
- ½" to ⅝" thick Stainless Steel Tank
- Stainless commercial grade water pump
- High performance cartridge filter
- Heavy gauge stainless automated lid
- User Adjustable Safety Platform/Walkway
- HEPA Air Filtration System

Our Bullet Recovery System has been engineered to provide the highest degree of safety, durability and convenience. No other system comes close in features, performance and value. Offering 28% to 50% greater protection and strength than 3/16" thick tanks. The system will fully contain water under all firing conditions.

RETRIEV-ALL

**SAVE YOUR FIRING RANGE - USE THE RETRIEV-ALL.**

- Solid steel frame and tube.
- Inexpensive sand as the stop medium.
- Center pivot height adjustment.
- Vented / Extended shooting port.
- Can be used as a Clearing Device as well.

38" long
18" wide
36" tall.

Principally designed as a **Brass and Shell** Retrieval System for any weapon ranging from pocket Derringer to 50 CAL. BMG.

<<< Portable Remote Firing Cart

Adjusts within seconds to any size firearm, from 50 BMG to pocket Derringer.

Brass Catcher -Lg >>>

Use with the RETRIEV-ALL, Bullet Tank, Ballistic Box, and the Range.

<<< Ballistic Cotton Box

Ease of retrieval for bullets or brass is the hallmark of this system.

Witness Protection Shield >>>

Principally designed as a remote firing protection shield and/or test fire viewing shield.

FOR USE IN FIRING RANGE OR WITH YOUR WATER TANK
Front Panel 48" wide x 72" tall.
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John Finor

AFTE 42\textsuperscript{nd} President (2010-2011)

John Finor, 67, of East Norriton, passed away on July 23, 2018, after battling cancer. John retired from the Philadelphia Police Department and the Montgomery County District Attorney’s Office after 39 years of service as a Firearms Examiner. In addition, John was a long-time member of the SHOT Show safety team.

He was an avid hunter that participated in numerous safaris and shared many stories to match those accomplishments with a friendly smile and a nice glass of wine.

John was a mentor, colleague, advisor and a friend to the members of the Firearm & Toolmark discipline, always encouraging the new members to get involved in the organization.

Robert “Bob” Smith


Robert “Bob” J. Smith, 78, of Orland Park, Illinois, passed away on February 25, 2019, after a long illness. Bob retired “twice”, once from the Chicago Police Department and then from the Illinois State Police. He was instrumental in getting the Firearm/Toolmark Unit up and running at the “newly” opened Illinois State Police Forensic Science Center in Chicago.

He actively participated in coaching girls’ basketball and softball at St. Ignatius College Prep and Mount Assisi Academy and was the golf coach at Mother McAuley High School. Bob was also a member of the Fraternal Order of Police Lodge 7 and Orland Park Law Enforcement Organization.

Bob was known by many who worked with him by the various monikers, “Coach”, “Uncle.”
In Memoriam

Edward “Ed” G. Bigler
AFTE 3rd President (1971-1972)

Edward Bigler, 95, of Ft. Walton Beach Florida, passed away on January 25, 2019. In 1969, Ed was the Chief of the Crime Laboratory Bureau, at the Florida Department of Law Enforcement, Tallahassee. Previously, he had spent 15 years with the Dade County Crime Laboratory in Miami.

Ed attended the 1st “AFTE” conference in February 1969 as a part of the American Academy Meeting in Chicago where the feasibility of forming a separate Firearm / Toolmark organization began. The members of this initial meeting were known as the “Chicago 36”.

Ed had a long career with AFTE. He was elected Vice President in 1970, where his duties included mailing out membership cards and establishing the first AFTE Historian position. At that time, no membership numbers were assigned and there were 88 members. By 1971, the membership swelled to over 175 and he was elected as the 3rd AFTE President. The 4th AFTE conference was held in Atlanta, Georgia, where he presided as President. Ed also held the position of a member of the Executive Committee for the period of 1972-1973. In 1973, the first group of 29 Distinguished AFTE members were named with Ed among that esteemed group.

William “Bill” Woodin
AFTE Technical Advisor & Distinguished Life Member

William Woodin, 92, of Tucson, Arizona, passed away in March, 2018. Bill was a contributor to the AFTE Journal with several articles detailing ammunition designations, cartridge case headstamps, numerical codes and color coding. Bill established the Woodin Laboratory in 1973. The Woodin Laboratory is a private nonprofit educational institute which contains a collection of thousands of modern small arms ammunition specimens, tracing the entire evolution of military and police ammunition from all over the world. Bill and the Woodin Laboratory have authored a three volume set entitled, “History of Modern U.S. Military Small Arms Ammunition”. Bill is one of the original founders of what is known today as the International Ammunition Association.
Christopher Kerr
Provisional Member

Christopher Kerr, 32, of the RCMP Firearms Identification Section in Vancouver, Canada, passed away suddenly of natural causes in May of 2018. He began his career in August 2009, and quickly demonstrated a mastery in some of the more complex cases.

He was an avid shooter and member of IPSC. Chris had a knack for languages and used his great sense of humor to entertain his colleagues, family and his many friends.

Paul Eschrich
AFTE Technical Advisor

Paul Eschrich, 90, of East Haven, Connecticut, passed away on December 18, 2018, surrounded by his family at his home.

He was a veteran of World War II serving in the US Army as a Medical Corpsman. He began his 40 year career as a chemist of the Olin Corporation and then as a “Ballistics” Engineer at Winchester. He retired after 15 years as a Technical Director and consultant for S.A.A.M.I. Paul was also a long-time SHOT Show Safety Advisor.

Paul was ordained a permanent deacon on June 22, 1985, in the Hartford Archdiocese. He served the Saint Therese Parish in Branford, Connecticut and was a Noble Degree of the Knights of Saint John. His other areas of interest included teaching judo, playing tennis, sailing, golfing and spending time with his shooting buddies.
In Memoriam

Duncan MacPherson

AFTE Technical Advisor

Duncan MacPherson, 80, passed away in March, 2019. Duncan was a member of the International Wound Ballistics Association (IWBA) and author of the book entitled, “Bullet Penetration: Modeling the Dynamics and the Incapacitation Resulting from Wound Trauma”.

Using his mechanical engineering degree and technical expertise, he applied his skills to trajectory dynamics that provided the background for bullet penetration models.

Duncan was a contributor to the AFTE Journal with articles such as, “Ballistic Chronograph Accuracy Assessment” and “Modeling Blunt Trauma from Projectile Impact”.

He was a technical consultant to NASA’s Mercury to Gemini and Apollo missions, a true “rocket scientist”.

The AFTE 2019 Host Committee would like to welcome you to the beautiful city of Nashville! The conference is being held at the Gaylord Opryland Resort and Convention Center.

This year’s host committee has worked hard to bring you a wide variety of workshops to choose from and a strong technical session. It is our sincerest hope that you cannot help but learn this week! We also have several evening events that are planned including the poster session, the ever popular bring your own slides, and an amazing banquet night. You will find all the details within the pages of this program.

Nashville is a spectacular city, full of things to do. Please take some time to do some exploring and enjoy our great city. The host committee would like to thank you for attending the 50th annual seminar and wish you a wonderful stay here in Nashville!

If you have any questions during your stay, please contact the host committee.

Please remember that name badges must be worn in order to gain admittance to the technical session, workshops, the poster session, the exhibit hall, and social functions.

2019 Host Committee Members

Chairs
Ryan Kent, Metro Nashville Police Department
LJ Hodge, Tennessee Bureau of Investigation

Members

Felicia Evans – Metro Nashville Police Department
Lisa Whitaker - Metro Nashville Police Department
Savannah Houk - Metro Nashville Police Department
Maria Coimbra - Metro Nashville Police Department
Stefanie Happ – El Paso County Sheriff’s Office
Kasia Lynch – Tennessee Bureau of Investigation
Joseph Kennedy – Tennessee Bureau of Investigation
Julie Knapp – Colorado Bureau of Investigation
Jeff Goudeau – Louisiana State Police
Connor Lamberson – Tennessee Bureau of Investigation
Jessica Hudson – Tennessee Bureau of Investigation
Stacey Hartman – Indiana State Police
Mike Coakley – Prince George County
Jori Farquharson – Washington State Patrol
Brock Sain – Tennessee Bureau of Investigation

Amanda Gibson – Plano Police Department
Shelly Carman – Tennessee Bureau of Investigation
Rhonda Evans - Metro Nashville Police Department
Greg Lee - Metro Nashville Police Department
Alex Brodhag – Tennessee Bureau of Investigation
Ladd Kuykendal – Tennessee Bureau of Investigation
Denver Hall – Tennessee Bureau of Investigation
Bridget Chambers - Metro Nashville Police Department
Derek Proctor – Tennessee Bureau of Investigation
Adrienne McCollum - Metro Nashville Police Department
Jessica Copeland – Kentucky State Police
James Reese - Metro Nashville Police Department
Kristin Heil - Metro Nashville Police Department
George Bouton - Metro Nashville Police Department
Don Carman – Retired Tennessee Bureau of Investigation and Metro Nashville Police Department
At the Hotel:

- The technical session will be in the Tennessee Ballroom
- The exhibitors will be located in the Tennessee Ballroom Lobby A
- There is free Wi-Fi in your guest room; however, there is no Wi-Fi in the meeting spaces.

Meeting Information:

Continuing Education Units (CEU) for Recertification:
There are 19 CEUs possible during the technical session. Please note that if you are in a workshop during the technical session you will need to substitute your hours accordingly.

Daily Hours:
Monday – 2 hours and 30 minutes
Tuesday – 6 hours and 25 minutes
Wednesday – 5 hours and 40 minutes
Thursday – 4 hours and 30 minutes

*Disclaimer: The views and opinions expressed by the presenters, and those providing comments on the presentations are theirs alone, and do not necessarily reflect the views, opinions, or positions of the Association of Firearm and Tool Mark Examiners.

In the City:

Nashville is a great city, but it is still a city! Please be smart and remember to be aware of your surroundings. Please consider the following when you are out and about on the town:

- Remove your name badges when you are not in the hotel.
- Travel with groups and stay in well-lit main thoroughfares
- Avoid carrying a purse when possible and do not display cash in public.
- Take care of each other!

SAFETY FIRST
BE CAREFUL
BE AWARE
BE SAFE
The Gaylord Opryland Resort and Convention Center

2800 Opryland Drive

Phone: 615-889-1000

The Gaylord Opryland is located minutes from the Nashville International Airport and downtown Music City. While you can find shopping and dining right under the hotel roof, you'll also want to explore nearby attractions including the Grand Ole Opry, Opry Mills, the Country Music Hall of Fame and the General Jackson Showboat. During your stay, make an appointment at Relâché Spa & Salon, or gather your group for an outing at Gaylord Springs Golf Links. The hotel's indoor and outdoor pools and 9 acres of lush, indoor gardens and cascading waterfalls will impress all visitors. Expect an extraordinary experience at Gaylord Opryland & Convention Center!

Due to the size of this amazing venue, you are encouraged to download the Gaylord Wayfinding App to assist you with navigating the property.

The Gaylord Hotels wayfinding app is available for download from the Apple App Store at the flowing link: https://itunes.apple.com/us/app/navigate-gaylord-hotels/id1127326165?ls=1&mt=8

This app is also available for Android through their app store under ‘Gaylord Opryland’.

Registration, the technical session, and vendors will all be located in the Tennessee Section on Level 2 of the Convention Center.
Exhibitors are located in the Tennessee Ballroom - Lobby A.
Booths will be open during the following hours:
Monday: 4:30 p.m. to 6:30 p.m. (During the poster session)
Tuesday and Wednesday: 7:00 a.m. to 5:00 p.m.
Thursday: 7:00 a.m. to 12:00 p.m.
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<td>Fort Scott Munitions</td>
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<td>Sensofar</td>
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<td>Mideo</td>
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<td>Alicona</td>
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<td>Collaborative Testing Services Inc.</td>
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<td>Cyber National Inc.</td>
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<td>Ultra Electronics (FTI)</td>
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<td>Leeds Forensic Systems</td>
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<td>Chemicals Test Kits and Lab Equipment (CTL)</td>
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</tbody>
</table>
Alicona Corporation  
*Faran Misaghi*  
150 Pierce Rd. Suite 130  
Itasca, IL  60143  
Phone: 630-372-9900  
www.alicona.com  
Alicona.US.alicona@bruker.com

ANAB  
*Nita Bolz*  
2000 Regency Pkwy, Ste. 430  
Cary, NC 27518  
Phone: 414-501-5494  
www.anab.org  
QualityMatters@anab.org

ATF – NIBIN Branch  
*Sharon Buchanan*  
99 New York Avenue NE  
Washington, DC  20226  
Phone: 202-648-7171  
www.ATF.gov  
Sharon.Buchanan@atf.gov

Cadre Forensics  
*Ryan Lilien*  
420 W. Huron Street Suite 204  
Chicago, IL. 60654  
Phone: 312-620-9958  
www.cadreforensics.com  
Forensics@CadreForensics.com
CartWinPro
Axel Manthei and Elke Manthei

Albrecht-Nutzel-Weg
29 86916 Kaufering, Germany
Phone: +49-8191-66704
Fax: +49-8191-973326
www.cartwinpro.com
info@cartwinpro.com

Center for Statistics and Application
In Forensic Evidence (CSAFE)

195 Durham Center
613 Morrill Rd.
Ames, IA. 50011
Phone: 515-294-7278
Forensicstats.org
harliej@iastate.edu

Chemicals Test Kits and Lab Equipment (CTL)
Henry Medollo

1016-3 Grand Blvd.
Deer Park, NY. 11729
Phone: 631-242-4249
www.ctlscientific.com
hmedollo@ctlscientific.com

Collaborative Testing Services Inc. (CTS)
Richard Hockensmith

P.O. Box 650820
Sterling, VA 20165-0820
Phone: 631-242-4504
www.ctsforensics.com
Richard.Hockensmith@cts-interlab.com
CyberNational, Inc.
Karen Montgomery
1512 Sarah Court
Murfreesboro, TN 37129
Phone: 615-893-1099
Fax: 615-895-2133
www.cyber-national.com
Karen@cyber-national.com

Forensic Pieces
Jan Johnson
4400 Bayou Blvd., Suite 30A
Pensacola, FL 32503
Phone: 850-332-0141
www.forensicpieces.com
Info@forensicpieces.com

Forensics Source (Safariland)
Allen Miller
13386 International Parkway
Jacksonville, FL 32218
Phone: 973-534-9983
Fax: 904-741-5407
www.forensicssource.com
Allen.Miller@safariland.com

Fort Scott Munitions
Robbie Forester
523 East Wall Street
Fort Scott, KS 66701
Phone: 620-223-1277
Fortscottmunitions.com
rforester@forstscottmunitions.com

Gun Learn
Daniel O’Kelly
P.O. Box 338
Lake Dallas, TX 75065
Phone: 831-422-4674
www.gunlearn.com
info@GunLearn.com
Image Access
Jonathan Wenninger
2511 Technology Drive Suite 109
Elgin, IL. 60124
Phone: 224-293-2585
Johnathan.wenninger@imageaccess.de

Justice Trax
Jason Pressly
1 West Main Street
Mesa, AZ. 85201
Phone: 480-222-8900
Justicetrax.com
Mary.cook@justicetrax.com

Leeds Forensic Systems, Inc. /Evofinder
Kevin Boulay, Neal Schrode, and Jake Kurth
17300 Medina Road, Suite 600
Minneapolis, MN  55447
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www.leedsforensics.com
sales@leedsmicro.com

Leica Geosystems
Darrell Whitfield and Ryan Rezzelle
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Norcross, GA  30092
Phone: 770-326-9536
www.leica-geosystems.us
Darrell.whitfield@leicaus.com

Leica Microsystems
Negin Jahangiri
1700 Leider Lane
Buffalo Grove, IL  60089
Phone: 847-405-7039
www.leica-microsystems.com
Vicky.thoene@leica-microsystems.com

Exhibitor Information
Mideo Systems, Inc.
Scott Heber
15177 Springdale Street
Hunting Beach, CA 92649
Phone: 800-258-1066
www.mideosystems.com
sheber@mideosystems.com

Savage Range Systems, Inc.
Cara Hanley
100 Springdale Road
Westfield, MA 01085
Phone: 413-642-4113
www.savagerangesystems.com
chanley@savagerangesystems.com

Sensofar
Alberto Aguilerrl
Parc Audiovisual de
Caalunya, Ctra. BV-1274, Km.1
08225 Terrassa (Barcelona), Spain
Phone: 617-678-4185
www.sensofarusa.com
mollon@sensofar.com

Team Fabrication, Inc.
Neil Hopkins
1055 Davis Road
West Falls, NY 14170
Phone: 716-539-1914
www.BulletRecovery.com
kim@teamfabrication.com
The Bullet ID Corporation
Greg Sullivan
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West Toronto, ONT M3J-3L5
Phone: 416-957-6560
www.bulletidentification.com
greg@bulletid.net

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Mira Carreiro
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events@ultra-ft.com

UNITRON
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Phone: 678-574-6777
www.unitronusa.com
Heston@unitronusa.com

Vigilant Solutions
Heather Richardson
1152 Stealth Street
Livermore, CA. 94551
Phone: 925-398-2079
www.vigilantsolutions.com
bevigilant@vigilantsolutions.com
Please join us for food, friends, and fun at the AFTE 2019 Welcome Reception

Dave and Busters - Sunday 6:00 p.m. – 9:00 p.m.

Hors d’oeuvres will be provided
Sponsored by Ultra Electronics (FTI)

WALKING DIRECTIONS

1. Depart the Delta Portico area from the Gaylord Opryland
2. Follow the little brick path across the ring road that goes around the hotel
3. This will lead you to a canopy side walk, which will take you past the hotel’s all-purpose building (ICE! Is held here) where you will then see the mall.
4. Dave & Buster’s anchors the side that is closest to the Gaylord Opryland.
5. Follow the side walk around and/or just cut through the parking lot for the party

Located approximately ½ mile away (~10 min walk)
<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saturday, May 25th</td>
<td>Early Registration – Tennessee Ballroom Lobby A We know you are excited (we are too!), but PLEASE reserve this small window for those with workshops on Sunday.</td>
<td>4:00 p.m. – 6:00 p.m.</td>
</tr>
<tr>
<td>Sunday, May 26th</td>
<td>Registration – Tennessee Ballroom Lobby A Workshops Welcome Reception - Dave and Busters (See page 16 for info)</td>
<td>7:00 a.m. – 4:30 p.m. 7:00 a.m. – 5:00 p.m. 6:00 p.m. – 9:00 p.m.</td>
</tr>
<tr>
<td>Monday, May 27th</td>
<td>Continental Breakfast Registration Technical Session Lunch Break Business Meeting Exhibitor Hours Poster Session Bring Your Own Slides</td>
<td>7:00 a.m. – 8:00 a.m. 7:15 a.m. – 4:00 p.m. 8:00 a.m. – 12:00 p.m. 12:00 p.m. – 1:30 p.m. 1:30 p.m. – 4:30 p.m. 4:30 p.m. – 6:30 p.m. 4:30 p.m. – 6:30 p.m. 8:00 p.m. – 10:00 p.m.</td>
</tr>
<tr>
<td>Tuesday, May 28th</td>
<td>Continental Breakfast Registration Exhibitor Hours Technical Session Lunch Break Technical Session Goddard Night</td>
<td>7:00 a.m. – 8:00 a.m. 7:15 a.m. – 4:00 p.m. 8:00 a.m. – 12:00 p.m. 12:00 p.m. – 1:30 p.m. 1:30 p.m. – 4:30 p.m. 6:30 p.m. – 8:30 p.m.</td>
</tr>
<tr>
<td>Wednesday, May 29th</td>
<td>Continental Breakfast Registration Exhibitor Hours Technical Session Lunch Break Technical Session Nashville Sounds Baseball Game</td>
<td>7:00 a.m. – 8:00 a.m. 7:15 a.m. – 4:00 p.m. 8:00 a.m. – 12:00 p.m. 12:00 p.m. – 1:30 p.m. 1:30 p.m. – 4:30 p.m. 5:00 p.m. – 10:00 p.m.</td>
</tr>
<tr>
<td>Thursday, May 30th</td>
<td>Continental Breakfast Registration Exhibitor Hours Technical Session Lunch Break Technical Session Raffle Drawing Cocktail Hour, Banquet and After Party</td>
<td>7:00 a.m. – 8:00 a.m. 7:15 a.m. – 12:00 p.m. 8:00 a.m. – 12:00 p.m. 12:00 p.m. – 1:30 p.m. 1:30 p.m. – 3:00 p.m. 3:00 p.m. – 5:00 p.m. 6:00 p.m. – 11:00 p.m.</td>
</tr>
<tr>
<td>Friday, May 31st</td>
<td>Workshops 5.11 Night Out</td>
<td>8:00 a.m. – 5:00 p.m. 5:00 p.m. – 8:00 p.m.</td>
</tr>
<tr>
<td>Weeklong Activities</td>
<td>First Time Attendee Bingo &amp; Photo Contest</td>
<td></td>
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</tbody>
</table>

**NOTE:** Lunches will not be covered by the Host Committee or Sponsors except for certain workshops. The only dinner included in registration is the Thursday night banquet.

***See pages 77-93 for workshop details and locations***
Schedule of Events

Sunday, May 26th

Registration
7:15 a.m. – 4:30 p.m. Tennessee Ballroom Lobby A

Workshops (See pages 77-93 for more details)

Morning Workshops
8:00 a.m. – 12:00 p.m. Subclass Characteristics
Nancy D. McCombs
8:00 a.m. – 12:00 p.m. Assisting the Firearms Examiner to Prepare for an ANAB Accreditation (17025:2017 and AR 3125)
Julie Knapp and Amy Weber
8:00 a.m. – 12:00 p.m. HI-Point Firearms Armorer Course
Brian Smelser and Chris Monturo
8:00 a.m. – 12:00 p.m. Best Practices for Using the VisionX Comparison Microscope for Firearms and Toolmark Examination
Paul Murphy and Kristina Godin

Afternoon Workshops
12:00 p.m. – 5:00 p.m. Understanding the Math of Bullet Path Analysis
Matthew Noedel
12:00 p.m. – 5:00 p.m. PhotoGUNmetry
Kristen Drury and Aaron Brudenell
1:00 p.m. – 5:00 p.m. HI-Point Firearms Armorer Course
Brian Smelser and Chris Monturo
1:00 p.m. – 5:00 p.m. New BULLETTRAX Hands-On Session
Andrew Boyle and Michel Paradis

Full Day Workshops
8:00 a.m. – 5:00 p.m. Contemporary Issues In Firearms Identification
Ron Nichols and Andy Smith
8:00 p.m. – 5:00 p.m. Implementation and Practical Applications of 3D Technology, Analysis and Statistics for FA/TM Examinations
Xiaoyu Alan Zheng, Thomas Brian Renegar, Michael Stocker, Johannes Soons, Nicholas Petraco, Ryan Lilien, & Erich Smith
8:00 a.m. – 5:00 p.m. Distance Determination: An Overview
Adam Grooms and Erica Lawton
8:00 a.m. – 5:00 p.m. Subclass Evaluation and Documentation
Mike Neel, Eric Freemesser, and Eric Collins

Welcome Reception
6:00 p.m. – 8 p.m. Dave and Busters
Schedule of Events

Monday, May 27th

Registration
7:15 a.m. – 4:00 p.m.  Tennessee Ballroom Lobby A

Continental Breakfast
7:00 a.m. – 8:00 a.m.  Tennessee Lobby A – Sponsored Cyber National

Technical Session - Morning

Location:  Tennessee Ballroom
Moderator: Savannah Houk

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<tr>
<td>8:00 a.m.</td>
<td>Color Guard Opening and National Anthem</td>
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<td>The Three Time and Current National Champions -</td>
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<td>Metro Nashville Police Drill and Ceremony Team</td>
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<tr>
<td>8:10 a.m.</td>
<td>Welcome to AFTE 2019!</td>
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<td>Director David B. Rausch, Tennessee Bureau of Investigation</td>
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<td>Captain Harmon Hunsicker, Metro Nashville Police Department</td>
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<tr>
<td>8:20 a.m.</td>
<td>Announcements</td>
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<td>Exhibitor Introductions</td>
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<td>AFTE President Introduction</td>
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<td>AFTE 2019 Host Committee Chairs Ryan Kent and L.J. Hodge</td>
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<td>8:40 a.m.</td>
<td>President’s Welcome</td>
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<td>Andy Smith, AFTE President</td>
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<td>8:50 a.m.</td>
<td>Recognition of Passed Members</td>
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<td>Historical Committee</td>
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<td>Key Note Speaker</td>
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<td>Honorable Judge Barbara Howe</td>
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<td>9:35 a.m.</td>
<td>AFTE 2020</td>
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<td>Mallory Foster</td>
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<td>10:00 a.m.</td>
<td>AM Break – Sponsored by Ultra Electronics (FTI)</td>
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<td>10:30 a.m.</td>
<td>OSAC Update</td>
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<td>Mark Keisler and Todd Weller</td>
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<tr>
<td>11:10 a.m.</td>
<td>AAFS Standards Board Update</td>
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<td>Gregory Laskowski</td>
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<tr>
<td>11:30 a.m.</td>
<td>Comparison of Several Blood Removal Solutions and Their Effects on Gunshot Residue</td>
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<td>Kulvir Sarai</td>
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<td>12:00 p.m.</td>
<td>Lunch Break</td>
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# Schedule of Events

**Monday, May 27**

## Technical Session – Afternoon

**Location:** Tennessee Ballroom

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<td>1:30 p.m.</td>
<td>Announcements and Door Prizes</td>
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<td>1:40 p.m.</td>
<td><strong>AFTE Business Meeting</strong>&lt;br&gt;AFTE President and Board of Directors&lt;br&gt;Attendance is encouraged!</td>
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<tr>
<td>4:30 p.m.</td>
<td><strong>Poster Session</strong>&lt;br&gt;Tennessee Lobby&lt;br&gt;Sponsored by Team Fabrication</td>
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<tr>
<td>8:00 p.m.</td>
<td><strong>Bring Your Own Slides</strong>&lt;br&gt;Tennessee Ballroom</td>
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AFTE 2020 Update

*Mallory Foster and Steven Aston*

The 2020 AFTE Training Seminar will be held at the Renaissance Austin Hotel in Austin, Texas. The “Keep Austin Weird” slogan promotes the funky, vibrant energy that the city exudes. Locals are wild, crazy, and... well, weird! We can’t wait to host you in our quirky city. So pull out your old tie-dyed attire and start growing out your man-buns! In 2020, we’re going to “Keep AFTE Weird”!

Mallory Foster and Steven Aston are your fearless leaders for the 2020 AFTE Training Seminar. Mallory works for the Texas DPS Crime Lab in Austin, while Steven works for the Austin Police Department Crime Lab. When not planning the AFTE seminar of your wildest dreams, Mallory plays with dogs. Lots and lots of dogs. Steven spends his free time playing trivia and camping in the wild. Alone, Mallory and Steven have no idea what they’re doing. Together, they are unstoppable.
Abstract: Mark Keisler serves on the Board of the OSAC and will be presenting an overall perspective on the OSAC work product and how the standards will effect laboratories and examiners. Todd Weller is the Chair of the Firearms and Toolmarks subcommittee. He will provide an update on the firearms specific standards that have been published and the subcommittee's future road map.
Update on the AAFS Academy Standards Board Firearms and Toolmark Consensus Body

Gregory Laskowski

Abstract: The purpose of this presentation is to inform the audience that the American Academy of Forensic Sciences has created a standards development organization (SDO) known as the Academy Standards Board. Of particular interest to AFTE and its members is the formation of the Firearm and Tool Marks Consensus Body. This consensus body is made up of subject matter experts in the field, academics, producers, consumer groups, and parties of general interest.

The FATM Consensus Body can accept proposals for standards from individuals or groups such as OSACS or develop their own. Standards proposed, developed, and published must adhere to ANSI guidelines. A public review process is mandatory for any guideline or standard developed for publishing.

The ASB FATM Consensus Body is a means to ensure that guidelines and standards in the discipline of firearms and tool mark examinations are produced and published that meet the expectations of the scientific community in addition to the legal community.

Presenter Biography:

Mr. Laskowski is a retired Supervising Criminalist with the Kern County District Attorney Forensic Science Division in Bakersfield, California where he supervised the Major Crimes Unit. He has over thirty years’ experience as a forensic scientist with both the Kern County Sheriff’s Department and the Kern County District Attorney’s Office. His university degrees include a BS degree in Biochemistry from the University of Southern California and a MPA degree from California State University Bakersfield. Currently, he is an Adjunct Professor of Forensic Science at California State University Bakersfield in addition to Oklahoma State University. He is the president of Criminalistics Services International, LLC a forensic science education and consulting firm. Gregory is a Diplomate with certification in Comprehensive Criminalistics with the American Board of Criminalistics.
Comparison of Several Blood Removal Solutions and Their Effect On Gunshot Residue

*Kulvir Sarai - National Firearms Examiner Academy Paper of the Year*

Abstract: A study was conducted to explore the efficacy of several blood removal methods on blood stained cloth and evaluate their effect on gunshot residues. Twill cloths were used to produce residue patterns and then soaked in blood. Attempts were made to remove the blood using seven different solutions, and the resulting cloths were tested using the Modified Griess and Sodium Rhodizonate methods, to evaluate the remaining gunshot residue patterns. An aqueous solution of 30% hydrogen peroxide and 10% ammonium hydroxide proved to be the best blood removal method while keeping the most similar gunshot residue pattern intact.

Presenter Biography:

Ms. Sarai started her career in Forensic Science in 2010 where she worked as a Forensic Toxicologist in Sacramento, California. In 2017, she moved into the Firearms Section and was accepted as a student of the National Firearms Examiner Academy for the 2017-2018 class. Kulvir holds a Bachelor’s degree in Chemistry from the California State University, Sacramento, as well as a Minor in Forensic Investigations.
CSAFE plays a central role in the advancement of the statistical bases for common forms of pattern and digital evidence, thereby working toward fulfilling the larger goal of placing forensic science on a firm scientific foundation.

Forensic practitioners nationwide attended CSAFE statistics courses 532

11 US and International collaborators such as Story County Sheriff, Israeli Police, Innocence Project

6 Collaborative research university partners

2015 Year of NIST Center of Excellence establishment

3 Minority serving institution partners

88 Researchers including distinguished statisticians, scientists, engineers and practitioners

ForensicStats.org
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ONLINE COURSES NOW AVAILABLE!
- OUR LIVE SEMINARS ARE ACCEPTED FOR IAI CERTIFICATION -

Why do many law enforcement professionals have to rely on someone else to handle, clear, ID or explain a firearm? Because until recently, there has never been a complete firearm training program.

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- The training for easily learning these tasks is available here.
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Safety
Nothing is left to chance. One misstep can mean disaster. Learn the safe practices and methods of handling and clearing all firearm designs commonly encountered by law enforcement.

Accuracy
No more mistakes. Each year 600,000 crime-guns and countless ammunition is recovered. Even a 1% error rate means 6,000 guns are improperly ID’d, allowing for lost prosecutions, jobs, licenses, and credibility.

Competence
Never be confused again. Understand and explain the ID, classification and mechanical operation of all firearm types and ammunition beyond the level necessary during cross examination.

International Firearm Specialist Academy

(813) 422-4674
info@GunLearn.com

www.GunLearn.com

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Stop by AFTE booth #306 to see demonstrations of the LCF3, Discovery-Z and EvoFinder® Automated Ballistic Identification System.

www.leedsmicro.com | 1-800-444-5333 | sales@leedsmicro.com
AFTE 2019
Nashville, TN

Monday, May 27th
4:30 - 6:30pm
TN Lobby of Opryland Hotel

The Poster Session is the perfect setting for interesting case write-ups, shorter research projects, students, or for the attendee who would rather have a more personalized presentation experience with their peers.

Vendors will also be present to showcase new and exciting products.

Hors d’oeuvres will be provided and a cash bar will be available.
Monday, May 27
8:00 – 10:00 PM
At the Opryland Hotel

Hosted by Mike Haag and Dan Alessio

Need a platform to speak about that interesting case without wearing a suit? Look no further! Bring Your Own Slides night is back and with it comes another opportunity to share all the strange and exciting things you’ve experienced over your career but don’t have enough for a full presentation.

Rules/Requirements:

- Presentations MUST be in PowerPoint format
- ALL presentations are limited to 10 minutes. Please plan your presentation to be 8 minutes and allow 2 minutes for questions. No exceptions!
- Make it fun! Catchy titles, fun wordplay, spice it up!

Please email your presentations to ‘byos.after2019@gmail.com’ using the subject line “BYOS” by May 10th.

- Sign up will be available on-site in Nashville based on availability after online submissions. Please bring your presentation to the registration desk.
## Schedule of Events

### Tuesday, May 27th

**Registration**

7:15 a.m. – 4:00 p.m.  
Tennessee Lobby A

**Continental Breakfast**

7 a.m. – 8:00 a.m.  
Tennessee Lobby A – Sponsored by Cyber National

### Technical Session - Morning

**Location:** Tennessee Ballroom  
**Morning Moderator:** Amy Weber

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<td>Pizza Bomber (Collar Bomb)</td>
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<td>A Curious Case Of Bogus Toolmarks</td>
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<td>National Firearm Reference Population Database</td>
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<td>The Validation of 3D Virtual Comparison Microscopy in the Comparisons of Expended Cartridge Cases</td>
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<td>Laura Knowles</td>
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<td>A High-Resolution Scanner for Nondestructive Visualization of Gunshot Residue Patterns On Fabric</td>
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<td>Mike Kusluski</td>
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<td>11:20 a.m.</td>
<td>Update on the Brundage/Hamby Ruger Ten Consecutive Barrel Research Project</td>
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<td>The Absence of Evidence? A Shooting Incident Reconstruction</td>
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**Tuesday, May 27th**

### Technical Session - Afternoon

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<tr>
<td>1:40 p.m.</td>
<td><strong>Wound Ballistics: Shots in Ballistic Gelatin and Analysis Through</strong></td>
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<td><strong>Computed Tomography Scanning</strong></td>
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<td>Nikolaos E. Tsiatis</td>
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<td>2:10 p.m.</td>
<td><strong>Evaluation of the Individuality of Glock 9mm Aperture Shear Marks</strong></td>
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<td>James E. Hamby, Ph.D.</td>
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<td>2:30 p.m.</td>
<td><strong>I Shot the Kitchen but Not the Police: OIS investigation</strong></td>
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<td><strong>Involving 5.45x39mm Ammunition</strong></td>
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<td>3:00 p.m.</td>
<td><strong>Afternoon Break – Sponsored by Team Fabrication</strong></td>
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<td>3:30 p.m.</td>
<td><strong>Secondary Movement of Fired Cartridge Cases</strong></td>
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<td>Matthew Noedel</td>
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<td>4:00 p.m.</td>
<td><strong>Reproducibility of Automated Bullet Matching Scores Using</strong></td>
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<td><strong>High Resolution 3D LEA Scans</strong></td>
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<td><strong>Understanding the Black Oxide Chemical Conversion Process as</strong></td>
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<td><strong>It Is Applied to Bullets</strong></td>
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<td>Mallory Foran</td>
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<td>4:45 p.m.</td>
<td><strong>The Utility of Double-Casting For Creating Cartridge Case Reproductions</strong></td>
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<td>Eric Law</td>
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<td>5:05 p.m.</td>
<td><strong>Bullet Subclass “Warning Coefficient”</strong></td>
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<td>Danny Roberge, Ph.D.</td>
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<td>6:30 p.m.</td>
<td><strong>Goddard Night</strong></td>
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Pizza Bomber (Collar Bomb)

Carlo J. Rosati

Abstract: The case of Brian Wells, a man who died after becoming involved in a complex plot which involved a bank robbery, a scavenger hunt, a homemade shotgun, and an improvised explosive device. Wells was killed when an improvised explosive collar detonated while he was surrounded by police in Erie, Pennsylvania.

Investigators from the Federal Bureau of Investigation in conjunction with the Bureau of Alcohol, Tobacco, Firearms, and Explosives and the Pennsylvania State Police and examiners from seven Units of the FBI Laboratory worked hundreds of hours on thousands of items of evidence.

This case study will focus on the information generated by laboratory examiners to help the investigators to focus the investigation of the case and to aid federal prosecutors to prosecute the responsible individuals for these crimes.

Presenter Biography:
Mr. Rosati has been in the field of Firearms/Toolmarks for the past forty years. Mr. Rosati is currently under contract with the United Nations as a Technical Advisor for Firearms and Toolmarks and as an Adjunct Instructor at Virginia Commonwealth University. He is court Qualified forensic firearms, toolmarks, gunpowder/gunshot residue, serial number restoration, auto theft, and shooting incident reconstruction in federal, state, and international jurisdictions.
A Curious Case of Bogus Toolmarks

Gerard Dutton

Abstract: Toolmarks are often found at burglary scenes when an offender tries to gain entry to the premises or locked receptacles within. Occasionally, the tool is left at the scene and if an evidentiary link can be established between a suspect and those tools (such as DNA or fingerprints), this provides a prime opportunity for toolmark comparison. The case recounted was an instance where a tool left at a crime scene appeared to be responsible for some marks as it was the only potential and obvious candidate, yet the analysis eliminated that tool. Possible explanations for the questioned marks were then explored which produced an unexpected result. This case will be discussed along with the important lesson in forensic investigation it provided - the importance of finding answers, even if irrelevant to the investigation.

Presenter Biography:
Gerard Dutton, from the Tasmania Police in Australia, has worked in forensic firearms and toolmarks investigation for 32 years. He has been a Distinguished AFTE member since 1997, has had 37 papers published in the AFTE Journal, and has twice been the recipient of the Steve Molnar Award (1997 and 2000). Gerard has been a member and Chairman of the AFTE Ethics Committee, a member of the AFTE Journal Editorial Review Committee, and is one of four Assistant Editors of the AFTE Journal.
National Firearms Reference Distribution Database

Xiaoyu Alan Zheng and Erich D. Smith

Abstract: The last decade has seen exciting progress in the development of measurement instruments, algorithms, data, and methods to facilitate objective analysis of toolmark comparisons. The science of firearms and tool mark analysis. The primary goal is to provide firearms and tool mark examiners the ability to support their testimonies with objective similarity values and statistically-sound quantitative expressions for the weight of the evidence. The National Institute of Standards and Technology (NIST), for example, developed correlation algorithms [1], procedures to estimate error rates [2], and standards for measurement quality control [3]. The Federal Bureau of Investigation (FBI) is evaluating a wide range of instruments and methods for the application of three-dimensional (3D) tool mark topography data in case work, including validating virtual comparison microscopy for use in casework. The Netherlands Forensics Institute (NFI) has developed and implemented comparison algorithms, a tool mark database, and statistical models in their Scratch [4] software platform to enable estimation of quantitative expressions for the weight of evidence, such as likelihood ratios.

In 2018, NIST, FBI and NFI started development of the National Firearm Reference Population Database (NFRPD). The database will contain firearm tool mark data, indexed by class characteristics, and associated quantitative comparison scores for various similarity metrics. The database serves as the foundational ground-truth that will ultimately enable examiners to report what statistical confidence they have for a comparison result. The tool mark population statistics extracted from the database will describe the frequency distributions of a similarity score for, respectively, same-source comparisons and different-source comparisons of tool mark samples. These distributions are required to estimate numerical expressions for the weight of the evidence, such as a likelihood ratio or error rates. No matter which statistical method or distribution model is used, a large and diverse reference population of ground-truth data is required for reliable conclusions. From this data, the population distributions relevant to the case will be extracted as defined by the evidence’s class characteristics.

The development of the reference database builds on the NFI Scratch software platform and the NIST ballistics toolmark research database [5]. The database is designed to encompass a variety of existing and future comparison metrics. Measurements are being performed at NIST and the FBI. The presentation will describe the overall design, workflow, potential implementation steps, and limitations of the NFRPD.

Presenter’s Biographies:

Xiaoyu Alan Zheng is a Mechanical Engineer at the National Institute of Standards and Technology (NIST). His primary research focuses on objective methods and procedures for firearms and tool mark analysis. Alan is a technical advisor for AFTE.

Erich D. Smith is a Physical Scientist Forensic Examiner and Technical Leader (TL) of the FBI Laboratory Firearms/Toolmarks Discipline (FTD) and is a Regular member of the Association of Firearm and Tool Mark Examiners (AFTE). Mr. Smith has been working with and evaluating novel 3D technologies since 2013 to determine their capabilities in forensic firearms identification.

Additional Research Contributors/Authors: Johannes Soons (FBI) and Martin Baiker (Netherlands Forensic Institute)
Features Present on Additively Manufactured Polymer Components: Selective Laser Sintering

Corey W. Scott

Abstract: Additive manufacturing, commonly referred to as “three-dimensional (3D) printing,” refers to a group of technologies able to transform virtual objects (digital blueprints) into physical objects through a process of selectively adding and fusing material in a series of layers, starting from one end of the object to its opposite end. While introducing new capabilities for the manufacturing industry, additive manufacturing also offers possibilities for nefarious use. It is increasingly important to intelligence and law enforcement agencies, for possible source attribution and investigative leads, to recognize when an additive process was used. The purpose of this presentation is discuss the indicators that may be present on evidentiary items to determine if they are consistent with being produced through an additive process, specifically Selective Laser Sintering (SLS).

Presenter Biography:

Corey Scott is a Physical Scientist-Forensic Examiner at the FBI Laboratory's Terrorist Explosive Device Analytical Center. Prior to his assignment at the FBI Laboratory, Mr. Scott was assigned to both the FBI New Haven and FBI New York Field Offices. Mr. Scott earned his B.S. in Biology (Concentration in Pre-Medicine), B.S. in Forensic Science, and M.S. in Forensic Science - Criminalistics from the University of New Haven in Connecticut. Mr. Scott is also an ANAB Technical Assessor.
The Validation of 3D Virtual Comparison Microscopy in the Comparison of Expended Cartridge Cases

Laura Knowles

Abstract: With the introduction of new available technologies that present alternatives to traditional light comparison microscopy, it is only a matter of time before this technology will become widespread for the purpose of rendering same source conclusions for toolmark comparisons. One of the more prevalent alternative methodologies to traditional comparison microscopy is the 3D scanning and virtual comparison microscopy (VCM) of fired ammunition components. There are already several advantages to this new technique which include improved lab efficiency as it relates to exhibit continuity, standardized viewing and lighting techniques, remote access to scans for ease of peer-to-peer verification, enhanced training methods through the ability to annotate, and computer aided verifications through the eventual application of objective criteria.

The Royal Canadian Mounted Police (RCMP) National Forensic Laboratory Services has recently acquired the Cadre TopMatch-3D scanner and associated VCM software, and conducted a study with the purpose of evaluating whether this novel technique is as good as, or better than, traditional light comparison microscopy as it relates to rendering same source conclusions in anticipation of implementing the system and software into routine casework. This was achieved by assessing the current capabilities of the new instrumentation by evaluating the same available surfaces for each method of comparison. All 3D scans were acquired using Cadre’s TopMatch-3D scanning hardware and all VCM comparative analysis utilized Cadre’s VCM software.

The study included the participation of all RCMP bench scientists qualified to perform firearms identification which resulted in a total of thirteen participants. They were each asked to examine fifty comparison sets of varying difficulty, each set consisting of two expended cartridge cases, of which forty were true identifications and ten were true eliminations. For each examiner, half the comparisons were performed using virtual microscopy and half were performed using traditional microscopy. Each set required a conclusion as to whether the two cartridge cases within each set were identified as having been fired in the same firearm, eliminated as having been fired in the same firearm, or neither identified nor eliminated as having been fired in the same firearm (inconclusive).

Of the forty true identifications available to each examiner, corresponding to a total of five-hundred and twenty comparisons, positive identifications were made more frequently using virtual comparison microscopy as compared to traditional light microscopy where inconclusive conclusions were provided at a higher rate.

Based on the above findings and additional analysis, considered together with the benefits that virtual comparison microscopy offers in the name of efficiency, it is apparent that Cadre’s 3D scanning microscope and its associated virtual comparison software tested in this study is an appropriate and valid technique for rendering same source conclusions in the comparison of expended cartridge cases, and can be implemented into routine casework for that purpose.

Presenter Biography:

Laura Knowles has a Bachelor Degree of Applied Science in Mechanical Engineering and is currently the Program Technical Leader for the RCMP Firearms & Toolmark Identification Program.
A High-Resolution Scanner for Nondestructive Visualization of Gunshot Residue Patterns On Fabric

Mike Kusluski

Abstract: The Modified Griess and Sodium Rhodizonate tests are the principal methods for visualizing propellant and vaporous lead residues, respectively. While these chemographic tests have been successfully used for decades, they have their limitations. The tests are destructive, incorporate toxic chemicals and must be conducted under a fume hood. They also require the examiner to balance the appropriate amounts of acetic acid, heat and pressure to produce a suitable result. Fabrics containing nitrites from laundry products or other sources can produce background interference to the Modified Griess test. The increasing popularity of pistols (over revolvers), Total Metal Jacketed (TMJ) bullets and lead-free ammunition has also diminished the prevalence and quantity of lead residues detected by the Sodium Rhodizonate test.

The photonic detection of gunshot residues using blue-green fluorescence and infrared reflectance has previously been described in the literature [1]. However, the small size of these residue particles combined with the wide diameter of GSR patterns limits the resolution possible with photography. It was proposed that the high resolution, close working distance and wide format of a flatbed scanner would improve nondestructive visualization of gunshot residues on fabrics over photographic techniques.

An Image Access WideTEK® 12 CCD flatbed scanner with 12” x 18.5” (310 x 470 mm) format and 1200 DPI resolution was modified by the manufacturer to operate in blue-green fluorescence and infrared-reflectance modes. Image resolution for the scanner was compared to that of a Nikon D3300 DSLR camera with a Tiffen 16 Orange filter and an infrared-capable Nikon D3200 DSLR camera with 850 nm filter. The characteristics of the GSR analytes detected by the photonic methods were also examined.

Targets produced using a range of firearms, calibers, ammunition, fabric substrates and muzzle-to-target distances were evaluated. Fabric background fluorescence was evaluated using two textile education kits, which featured a combined 270 swatches, representing a cross-section of commercially-produced textiles. The contributions of propellant composition and morphology were evaluated using six sets of custom-manufactured 9mm Luger cartridges, as well as a range of common commercial ammunition. The detrimental effect of bloodstains and the efficiency of common blood removal methods were also evaluated.

The scanner successfully visualized gunshot residue patterns, allowing muzzle-to-target distances to be estimated. It is worth noting that the scanner detects the same residues as the chemographic tests, but via different analytes. While the Modified Griess test detects burned propellants, blue-green fluorescence detects unburned propellants. (Both methods detect partially-burned propellant particles). While the Sodium Rhodizonate test forms a color reaction with vaporous lead, infrared reflectance detects any infrared-opaque residues, including vaporous lead, carbonaceous smoke/soot, the charred portions of partially-burned propellant particles and graphite-coated unburned propellant particles. Consequently, the patterns produced by the scanner have a different appearance than those produced by the chemographic methods. However, they can still be used for muzzle-to-target distance estimation and to provide information complementary to the chemographic methods.

Research Participants: Malcolm Hreben, Courtney Lane, Mariah Mullan, and Josh Strine

Presenter Biography:

Mike Kusluski is an Assistant Professor in the Forensic Science Program at Madonna University. His forensic laboratory career with the Michigan State Police, Detroit Police Department and Ohio Bureau of Criminal Investigation includes experience in Firearms & Tool Marks Examination, Bloodstain Pattern Analysis, Controlled Substances Analysis and Crime Scene Investigation. His research interests include shooting incident reconstruction, gunshot residue pattern examination and bloodstain pattern analysis.
Update on the Brundage/Hamby RUGER 10 Consecutive Barrel Research Project

James E. Hamby, Ph.D. and David J. Brundage, M.S.

Abstract: This presentation provides an 'update' to the RUGER 10 Barrel Research Project. To date, a total of 724 participants from 36 countries have submitted answers - many of whom have used some form of ballistics imaging to arrive at their answers. The recently issued PCAST Report was critical of this (and other) research as it was a 'closed set' (sampling without replacement). The authors argue that the worldwide research project demonstrates the ability of examiners to arrive at proper conclusions based on their training and experience.

Although AFTE doesn't 'count' inconclusive results as an error, an 'error' rate was calculated using the 7 inconclusive results which would indicate the rate to be 0.06445.

Presenters Biographies:

Dr. Jim Hamby has been a firearm and tool mark examiner for 48+ years, is a past Editor of the AFTE Journal and Past President of AFTE. This is Jim’s 48th consecutive AFTE Seminar.

Dave Brundage has been a firearm and tool mark examiner for 46+ years and is a Past President of AFTE.
Absence of Evidence? A Shooting Incident Reconstruction

Alexander Jason, CSCSA

Abstract:

An officer involved shooting incident occurred during a bizarre burglary. The absence of gunshot residue (GSR) evidence became a central issue providing a foundation for civil litigation. Although much of the activity was captured on several video cameras, the actual shooting incident was not.

This presentation includes video from the incident and demonstrates how the analysis of video frames before and after the shooting were used to make significant determinations -- and how the thorough evidence collection at the scene led to a resolution.

Presenter Biography:

Alexander Jason is an independent forensic consultant board certified as a Senior Crime Scene Analyst and as a Force Science Analyst. He performs research in wound ballistics and in the dynamics of shooting incidents. Jason is also board certified in Forensic Photography and Digital Imaging.

He is a Fellow of the American Academy of Forensic Sciences, the International Association for Identification, the International Association of Bloodstain Pattern Analysts, and has been a Technical Advisor to the Association of Firearm and Toolmark Examiners for over 25 years.
Wound Ballistics: Shots in Ballistic Gelatin Torso and Analysis Through Computed Tomography Scanning

Nikolaos E. Tsiatis

Abstract: This presentation will discuss the relationship between the data that correlates the type of bullet with the resulting wound it causes when it perforates the human body. In wound ballistics research, it is important to understand the injurious effects on the human body associated with the type of bullet that created the victim’s wound. This understanding can be derived through experimental shootings into suitable tissue simulant materials using different ammunition and bullet types.

The results of this study show that a highly accurate numerical analysis of the created cavities produced by experimental shootings is possible using the 3D digital imaging capabilities of CT scanning while the permanent wound track can be observed and measured with accuracy.

Presenter Biography:

Nick Tsiatis joined the Hellenic Police in 1995 and has been serving in the Forensic Science Division / Firearms Section, since 2001. He is currently a Police Lt. Colonel, a court qualified Firearms & Tool Mark Examiner, and Physicist. Mr. Tsiatis has a M.Sc. in Applied Physics and a Ph.D. in wound ballistics from the Department of Forensic Medicine and Toxicology/School of Medicine/University of Athens. He has been a distinguished AFTE Member since 2016.
Evaluation of the Individuality of GLOCK 9mm Aperture Shear Marks

James E. Hamby, Ph.D.

Abstract: A total of 3,156 GLOCK pistols, manufactured over a 30 year period in Austria and the United States, were used to generate a sample of the same size. Our research hypothesis was that no cartridge cases fired from different 9-mm semiautomatic GLOCK pistols would be mistaken as coming from the same gun. Using optical comparison microscopy, two separate experiments were carried out to test this hypothesis. A subsample of 617 test-fired cases was subjected to algorithmic comparison by Ultra Forensics' Integrated Ballistics Identification System (IBIS). The second experiment subjected the full set of 3,156 cases to manual comparisons using traditional optical comparison pattern matching. None of the cartridge cases were “matched” by either of these two experiments. Using these empirical findings, an established Bayesian probability model was used to estimate the chance that a 9-mm cartridge case, fired from a GLOCK, could be mistaken as coming from the same firearm when in fact it did not (random match probability).

Presenter Biography:

Dr. Jim Hamby has been a firearm and tool mark examiner for 48+ years, is a past Editor of the AFTE Journal and Past President of AFTE. This is Jim’s 48th consecutive AFTE Seminar.

Additional Research Contributors:

Stephen Norris, B.S. and Nicholas D.K. Petraco, Ph.D.
I Shot the Kitchen But Not the Police: An Officer Involved Shooting Reconstruction

Gregory Laskowski

Abstract: The purpose of this presentation is to educate the audience on the reconstruction of an officer involved shooting investigation from a defense examiner’s perspective in terms of:

• Reviewing case documents and photographs
• Working with other experts in forensic disciplines
• Examining evidence with restrictions imposed on an out-of-state examiner
• Examining the scene of the crime five years later
• The process of proving or disproving the defense’s hypothesis

In 2010, police officers working an undercover illegal drug sting operation engaged in a firefight with several suspects inside a residence. In a scene, reminiscent with the gunfight at the OK Corral, the participants engaged in close combat resulting in one officer killed and several wounded including an informant. The suspects in this case also suffered casualties with one deceased at the scene, and one mortally wounded. Two surviving suspects were charged in the case, one of them with capital murder as the result of the death of a police officer. The question posed was - Did the client of the attorney that hired this examiner fire the fatal rounds?

Based upon the analysis of the evidence, the examination of the scene of the shooting, and expert opinions from practitioners in other disciplines it was concluded that the shooter did not cause the fatal gunshot wound to the police officer or the non-fatal gunshot wounds to the surviving officers and the informant. In fact, none of the rounds fired by the defendant struck anyone. As a result of the work by this examiner the capital murder charges were dropped. The defendant plead to a charge with life in prison.

Presenter Biography:

Mr. Laskowski is a retired Supervising Criminalist with the Kern County District Attorney Forensic Science Division in Bakersfield, California where he supervised the Major Crimes Unit. He has over thirty years’ experience as a forensic scientist with both the Kern County Sheriff’s Department and the Kern County District Attorney’s Office. His university degrees include a BS degree in Biochemistry from the University of Southern California and a MPA degree from California State University Bakersfield. Currently, he is an Adjunct Professor of Forensic Science at California State University Bakersfield in addition to Oklahoma State University. He is the president of Criminalistics Services International, LLC a forensic science education and consulting firm. Gregory is a Diplomate with certification in Comprehensive Criminalistics with the American Board of Criminalistics.
Secondary Movement of Fired Cartridge Cases

Matthew Noedel

Abstract: Shooting scene reconstruction often considers the location and distribution of fired cartridge cases. Many studies have evaluated the "ejection pattern" of semiautomatic firearms under various circumstances. Relatively untested, however, is how much displacement will occur to an already landed and stable fired cartridge case due to "traffic" through the scene. A series of experiments was conducted where cartridge cases already on the ground and stationary were run over by vehicles to measure the amount of secondary movement that occurs. The observations from this study support that fired cartridge cases that have stabilized onto relatively flat pavement generally do not move far from where they came to rest when they are run over by automobile tires.

Presenter Biography:

Matthew Noedel has over 30 years of experience in forensic science with 15 years at the Washington State Patrol Crime Laboratory and 15 years as a private consultant at Noedel Scientific. He is a past president of the Northwest Association of Forensic Scientists and the Association for Crime Scene Reconstruction. In addition, Mr. Noedel is a distinguished member and former Journal Editor of the Association of Firearm and Tool Mark Examiners and is certified in Firearms, Tool Marks, and Gunshot Residue from AFTE.
Reproducibility of Automated Bullet Matching Scores Using High Resolution 3D LEA Scans

Kiegan Rice M. Sc.

Abstract: Development of automated bullet matching algorithms based on 3D scans of land engraved areas (LEAs) has become a prominent area of research in recent years. However, automated methods rely heavily on the data gathered in 3D scans. The high-resolution 3D scan data can vary depending on which operator scans the LEA or which microscope it is scanned on. It is therefore important to study the reliability of automated approaches and the potential impact the scanning process can have on accuracy. In order for a method to be reliable, pairwise matching scores for two bullet LEAs need to be similar regardless of which operator or machine gathers the data.

A repeatability and reproducibility (R&R) study to evaluate sources of variability was completed in order to address this issue. R&R studies are used to quantify two aspects of data collection: the repeatability of measurements when taken under the same environmental conditions, and the reproducibility of measurements when taken under different environmental conditions.

Nine bullets, three each from three different barrels, were repeatedly scanned at Iowa State University's High Resolution Microscopy Lab. Five microscope operators captured scans of each bullet on two Sensofar Confocal Light Microscopes, restaging each bullet on the microscope for each new repetition.

This presentation will contain results from the study, addressing the observed differences on extracted LEA signatures as well as the impact on accuracy of an automated matching algorithm proposed by Hare, Hofmann, and Carriquiry of the Center for Statistics and Applications in Forensic Evidence (CSAFE). Pairwise matching scores for LEAs are minimally affected by operator. The largest sources of variability in pairwise scores are individual bullet characteristics such as breakoff or pitting.

Presenter Biography:

Kiegan Rice is a graduate research assistant with the Center for Statistics and Applications in Forensic Evidence (CSAFE) at Iowa State University. Her research focuses on automated image-analysis algorithms for firearms comparisons. She is a Ph.D. candidate in the Iowa State University Department of Statistics, under the advisement of Drs. Heike Hofmann and Ulrike Genschel.

Additional Research Contributors/Co-Authors:

Heike Hofmann Ph.D. and Ulrike Genschel Ph.D.
Understanding The Black Oxide Chemical Conversion Process
It Is Applied to Bullets

Mallory Foran

Abstract: Coatings have been applied to bullets for a number of years, in an ongoing effort to reduce barrel fouling and put a proprietary new product onto the market. Black oxide bullets like the Winchester Black Talon and Lubalox product lines, introduced in the early 1990’s weren’t coated, but instead underwent a chemical process that changed the metal to a dark black color. A case with a black bullet that was encountered in the laboratory and a lack of published reference materials on the subject led the author to look into whether the black oxide affected individual marks left on fired bullets, and therefore the conclusions that would be reached by firearms examiners. The hypothesis was that the black oxide layer on bullets would not affect examiner’s conclusions, compared to the conclusions that examiners would reach when comparing copper jacketed bullets.

The goal of this presentation is to provide informative insight to how bullets undergo the process of black oxide, as well as the history behind other bullet “coatings,” such as Ny clad and Hi-Tek bullet coating. The majority of the information about the chemical process was provided while on a tour of Cleveland Black Oxide, a local company which performs the black oxide process on a variety of everyday items. Winchester also used Cleveland Black Oxide as their supplier for Black Talon bullets when the cartridges were being sold, and black oxide Winchester products continue to come from the Cleveland Black Oxide facility today.

The study involved test packets made up of Jesse James Ammunition Black Label Ultimate Defense bullets (black oxide) and Federal American Eagle copper jacketed bullets that were fired through firearms from the Firearms section Reference Collection. Comparisons were performed between copper jacketed knowns and unknowns, between black oxide knowns and unknowns, and a mix of copper jacketed and black oxide knowns and unknowns.

Presenter Biography:
Mallory Foran, Forensic Scientist I, is a Firearm and Tool Mark Examiner Trainee at the Cuyahoga County Regional Forensic Science Laboratory in Cleveland, Ohio. She has been employed there since 2017 and is a graduate of the 2018 National Firearms Examiner Academy Class.
The Utility of Double-Casting For Creating Cartridge Case Reproductions

Eric Law

Abstract: This presentation will assist the audience to better understand the variability within the double-casting process through use of an IBIS® Heritage System, as well as applications of double-casting in forensic science.

Due to the variability that arises in the breech face and firing pin impressions on multiple cartridge cases fired by the same firearm, a method of reproduction is needed to create standardized cartridge cases. A process called double-casting has been used that involves creating a silicone rubber mold of a cartridge case, and then uses a plastic resin casting material to make a cartridge case reproduction. The first part of this study analyzed casts of the National Institute of Standards and Technology (NIST) standard cartridge case (SRM 2461). Integrated Ballistic Identification System® (IBIS) data and visual comparisons showed the method of double-casting was able to reproduce fine detail that is visible even at 100x magnification. Prior to widespread use, it is important to characterize the effects of within- and between-mold variability of the casts.

Twenty-five cartridges were fired by a SCCY CPX-2, Hi-Point C9, and Smith & Wesson SD9VE and the cartridge cases were replicated using the double-casting process. Three molds were created for each cartridge case, and five sets of double-casts were made from each of those molds. In total, 1125 double-casts were entered into an IBIS® Heritage System. Within- and between-mold comparisons were performed for each firearm utilizing the breech face and firing pin correlation scores as a measure of similarity between the images. Some instances of significant differences between the mold and cast sets were found. However, visual comparisons of (1) the casts to their original cartridge cases, and (2) the casts to other casts of the same cartridge case both showed that the double-casting method reliably reproduces the fine detail that is present on the original cartridge cases.

Double-casting has many potential applications. The pattern interpretation areas of forensic science are frequently criticized due to their subjective nature, and many of these critiques have been summarized in the NAS and PCAST reports. To strengthen the scientific foundations of firearms examination, the reproducibility of cartridge case comparisons needs to be known. Reproducibility will ensure that different examiners reach the same conclusion when comparing cartridge cases with the same level of detail. The double-casting method described above is currently being applied for this purpose.

Presenter Biography:

Eric Law received a BS, MS, and is currently pursuing a PhD in the Department of Forensic and Investigative Science at West Virginia University. His research interests focus primarily on firearm evidence interpretation.

Research Partner: Keith Morris
Bullet Subclass “Warning Coefficient”

Danny Roberge, Ph.D.

Abstract: Our Objective Identification (OI) model provides probabilities and error rates that may help support expert conclusions in court. Those probabilities are derived from scores representing the degree of similarity between compared bullets. Our OI model assumes that only individual characteristics (i.e., individual random marks unique to each barrel) contribute to the similarity score. However, consecutively rifled barrels sometimes get common bold marks from manufacturing tools that yield high similarity scores as well. In those circumstances, two non-match bullets sharing the same manufacturing subclass striations may erroneously be identified as a potential match. When suspected, bore inspection is recommended to detect the presence of typical subclass long striations along the barrel’s rifling.

3D images captured with a sufficiently large field of view (FOV) can help in analyzing those striations and warn us that subclass striations may be significantly contributing to the high similarity score observed. This presentation describes a method, based on our Objective Identification model, to digitally detect highly similar non-matching bullets that have strong subclass striations.

Presenter Biography:

Danny Roberge received BSc and MSc Degrees in Physics Engineering from École Polytechnique de Montréal (Montréal, Canada) in 1989 and 1991, respectively. In 1995, he completed his PhD in Physics (optical pattern recognition) at Université Laval (Quebec City, Canada). He was subsequently awarded a fellowship for a post-doctoral project in Toronto, Canada, that was related to optical fingerprint identification and biometric encryption. In 2000, he joined the Research and Prototyping Group at Ultra Electronics Forensic Technology as a Senior Scientist, and has developed and implemented algorithms related to the acquisition and correlation of bullet and cartridge case images for IBIS. He is the author and coauthor of several patents.
Tuesday Evening Events.....

Goddard Night
6:00PM - 8:30PM

Prost! Come enjoy live music, Bavarian brews and Homestyle German food at Nashville’s only authentic Bavarian Bierhall. Ticket prices include access to the private event room where a buffet of Bavarian style hot and cold appetizers will be served along with different selections of German beers. The full menu will also be made available to those interested.

The event will take place at the Bavarian Bierhaus located in the Opry Mills Shopping Center, within walking distance of the hotel. Gaylord Resort also provides free shuttle service to and from Opry Mills.

The AFTE Host Committee would like to extend a special thank you to NIST for providing two stipends to fully fund two individuals to attend the 2019 seminar.
## Schedule of Events

### Wednesday, May 29th

### Registration
7:15 a.m. – 4:00 p.m.  Tennessee Ballroom Lobby A

### Continental Breakfast
7:00 a.m. – 8:00 a.m.  Tennessee Ballroom Lobby A - Sponsored by Cyber National

### Technical Session - Morning

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# Schedule of Events

**Wednesday, May 29th**

## Technical Session - Afternoon

**Location:** Tennessee Ballroom  
**Afternoon Moderator:** Daniel Gammie

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| 1:40 p.m. | **Evaluation of the Vision X Comparison Microscope and Its Potential Impact on the Firearms and Toolmark Community**  
Mark S. Dreyfuss Ph.D | 58   |
| 2:10 p.m. | **Physical Matching and Microscopic Comparison of Broken Knife Blades**      | 59   |
|            | Jaco Swanepoel                                                               |      |
| 2:30 p.m. | **A2LA Accreditation**                                                       | 60   |
|            | Elizabeth Carbonella                                                         |      |
| 3:00 p.m. | PM Break - Sponsored by Brushworks Painting                                   |      |
| 3:30 p.m. | **Uncertainty Budget Framework for Automated Firearms Identification**       | 61   |
|            | T.V. Vorburger                                                               |      |
| 4:00 p.m. | **Characterization of a Non-Linear Photometric Stereo Sensor Optimized for Fired Bullet Topography Capture**  
Serge Levesque | 62   |
| 4:30 p.m. | End of Session                                                               |      |
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Can We Be Confident in our NIBIN Associations?

Nathan Von Rentzell

Abstract: Can firearm examiners utilize NIBIN correlation results with accuracy and confidence?

The purpose of this NIJ funded study was to evaluate the reliability of NIBIN correlation results. The field of firearm examination is trending towards issuing unconfirmed NIBIN leads as opposed to microscopically confirmed NIBIN hits. This movement has been in an effort to expedite the overall NIBIN process in order to help with timely investigative information.

With the three dimensional imaging and upgraded algorithms, can a firearm examiner accurately and reliably determine a NIBIN hit solely utilizing the NIBIN database?

In this study, over 500 known test fired cartridge cases were entered into the NIBIN demonstration database. AFTE certified firearm examiners attempted to find the correct corresponding test fired cartridge case for 50 unknown cartridge cases. This test was conducted two times utilizing 2D only images and 3D only images. The same firearm examiners then utilized a comparison microscope to compare a different set of unknown cartridge cases to the same initial 500 known test fired cartridge cases. These microscopic results were compared to the results of the NIBIN only comparisons.

A second component of this study was designed to evaluate the NIBIN correlation algorithms. This was done by entering over 500 known test fired cartridge cases into the actual NIBIN database. The corresponding known matching test fires were then entered into the NIBIN database and correlated. The position each known match in "Rank Sort" was noted.

Presenter Biography:

Nathan Von Rentzell is a Firearm and Toolmark examiner at the Denver Police Department Crime Laboratory. He is a 2017 graduate of the National Firearms Examiner Academy (NFEA) graduate, and he was the NFEA research project presenter at AFTE 2018.

Additional research contributors:

Charles Reno, Firearms/Toolmarks Unit, Denver Police Department Crime Laboratory

Zachary Kotas, Firearms/Toolmarks Unit, Denver Police Department Crime Laboratory
Clues From Impact: The Bullet “Autopsy”  

R. T. Wyant M.S.

Abstract: The ‘bread and butter’ of the firearms examiner is comparing fired bullets recovered from crime scenes and bodies to test fired bullets from seized firearms. As we know, bullets can and will hit many things as they attempt to reach their target, leaving impact defects, additional marks, material transfer, and fibers on the bullet surface.

Applying comprehensive observation practices to the analysis of fired bullets is preached by most instructors of shooting incident reconstruction classes, but what level of detail related to bullet impacts is routinely documented, or further, reported to the investigator? The clues left on those bullets, those that could help the investigator piece together an event, are sometimes overlooked, ignored, or misinterpreted during the critical forensic exam. A bullet on the laboratory bench, much like a body on a silver table, tells a story of its ultimate end.

Affordable high-speed video cameras allow us to illustrate the importance of observations associated to bullet impacts on various materials often encountered in casework.

Our testing served to underscore the significance of the forensic firearms examiner to consider a more holistic and in-depth approach to effectively conduct an ‘autopsy’ on bullets as part of their normal course.

Presenter Biography:

Rick Wyant, M.S., is a supervising forensic scientist with over 23 years of experience currently employed by the Washington State laboratory in Seattle. He is a distinguished member of AFTE, co-chaired the 2014 AFTE Seattle training conference, and an instructor at NFEA. He performs firearm examination, shooting reconstruction, training, and less lethal weapon consulting all over the US and abroad.
Automatic Matching of Hamby Sets: Friends, False Friends, and Clones
Heike Hofmann

Abstract:
Over the past year, we have had the opportunity to scan several Hamby Sets from different Forensic Labs. Scans from another two Hamby sets are available from the National Ballistics and Toolmarks Research Database. We were also given two clone sets by Prof Hamby.

This gave us at least twelve bullets from each of the barrels and allowed us to turn the tables: Instead of matching bullets to bullets, we can now take a look at how well each of the ten barrels marks and how much variability we see in the scores for each of the barrels.

Using the automatic matching algorithm, we were also able to evaluate the clone bullets in more detail and compare scores from clone to clone and clone to bullet. Results show that clones generally result in lower scores, but are still identified as matches to bullets from the same barrel.

Presenter Biography:
Heike Hofmann is a Professor of Statistics at Iowa State University and a Fellow of the American Statistical Association. She is affiliated with CSAFE where she has been working on automatic matching of bullet striation marks.

Research Contributors:
Susan Vanderplas and Alicia Carriquiry
What’s New In Ammunition / Don’t Assume Headstamp ID

George Kass

Abstract: A review of what is new in ammunition, bullets and companies. A discussion of why not to assume Headstamp identification without using a Headstamp database and your 5th sense. When in doubt double check the ID.

Presenter Biography:

George G. Kass answered his first forensic question ca. 1960. He became an AFTE Technical Advisor 1976. Mr. Kass was given regular membership and then awarded distinguished membership. He started Forensic Ammunition Service in 1981 and currently does expert witness work, consulting and training seminars for firearms examiners on ammunition.
The Human Factor in Forensic Peer Review

Erwin Mattijssen

Abstract: Most forensic feature comparison disciplines rely heavily on the judgements of examiners. To ensure the quality of examinations, peer review procedures, where a second examiner reviews the work of a first examiner, have been an accepted standard for a long time. In recent years, there has been criticism about the human factor effects in examinations performed by forensic examiners. Different types of peer review are used in practice and are often applied without a clear empirical justification of the actual value in a forensic setting. This study examines potential biases in peer review processes.

Although this study was performed with firearms examiners the outcomes are useful for other forensic feature comparison disciplines.

Presenter Biography:

Erwin J.A.T. Mattijssen has been working as a Forensic Firearms Examiner at the Netherlands Forensic Institute since 2010. After receiving a BSc degree in Biology at Leiden University (2007) he received a MSc degree in Forensic Science at the University of Amsterdam (2009) and in Teaching Biology at Leiden University (2010). Since 2013, he has worked as coordinator and lecturer for the course ‘Observer Based Techniques’ within the MSc program ‘Forensic Science’ at the University of Amsterdam. In 2015 he started his PhD project, focusing on the human factor in forensic science, in collaboration with the Radboud University Nijmegen and Leiden University in the Netherlands.
Metal Injection Molding – Manufacturing Review and Implications for Comparison and IBIS Performance

Ronald Nichols

Abstract: The purpose of the presentation is to provide attendees with an understanding of the metal injection molding (MIM) process, the potential for subclass characteristics and the implications of that potential for firearm examiners and IBIS® technicians.

Metal injection molding (MIM) is a process by which various firearm parts including triggers, lock hoods, and housing blocks among others. The flexibility of MIM to use various types of metal and produce parts in high volume at low cost has caused the firearms industry to be the largest consumer of MIM components in the United States. Metal injection molding has also been used to produce firearm parts that mark ammunition components including firing pins, extractors and ejectors. This presents a significant issue for firearm examiners and IBIS® technicians because parts produced in the same mold have the potential for subclass characteristics.

Presenter Biography:

Ron Nichols is a distinguished member of AFTE, having been awarded the Steve Molnar Key Person of the Year Award and the Member of the Year Award. He is also a member of the California Association of Criminalists, former President and past recipient of the Paul Kirk Award and Anthony Longhetti Distinguished Member Award. He is author of Firearm and Toolmark Identification: The Scientific Reliability of the Forensic Science. He has 34 years of experience as a forensic scientist, 27 as a firearm and toolmark examiner. He is President of Nichols Forensic Science Consulting offering training to include a Firearm and Toolmark Identification Training Academy and advanced topics in firearm and toolmark identification.
Novel Distance Estimation for a Shotgun Discharge At Close Range

Dr. Rachel Bolton-King

Abstract: The purpose of this presentation is to evaluate a new method for estimating shotgun-related shooting distances at close range, typically <1 m.

The research proposition was that close firing distances can be estimated from measuring the size of the shot-defect created upon a clothed human simulation.

This research demonstrates the potential for a simple, cheap and non-destructive new method to estimate shooting distance at close range (<1m) through the application of traditional photography, and analysis using open source software (Fiji/ImageJ). This method still requires further testing, but has the potential for application in estimating firing distance when shot have not sufficiently spread and/or to further corroborate gunshot residue patterns observed through visual or chemical analysis.

Presenter Biography:

Dr Rachel Bolton-King is an Associate Professor of Forensic Science at Staffordshire University and AFTE Technical Advisor. She received the AFTE Scholarship in 2010 and is a professional member of the Chartered Society of Forensic Sciences. Her primary research interests lie in maximizing intelligence from shooting incidents, legal and illegal manufacturing of firearm and ammunition components, and the non-destructive imaging of firearms and their fired components. Rachel has been conducting research, publishing, presenting and teaching in the field of forensic firearm identification, ballistics and gun crime investigation since 2008, and works in collaboration with forensic practitioners and law enforcement internationally. She has recently been awarded a prestigious Churchill Fellowship and will be conducting research into the integration of gun crime technologies and international best practices within USA, South Africa and France during the summer. Rachel is currently supervising six PhD researchers, including four international forensic practitioners, and leads Research4Justice (www.research4justice.ac.uk), an innovative project to openly share forensic and criminal justice focused research to professionals and researchers across the world.
Evaluation of the Vision X Comparison Microscope and Its Potential Impact on the Firearms and Toolmark Community

Mark S. Dreyfuss Ph.D.

Abstract: The purpose of this presentation is to promote an appreciation of the potential for forensic digital imaging technology inclusion in Firearms and Tool Marks casework and to allow for remote microscopic comparisons of evidence. A series of projects compared the capabilities of the new VisionX comparison microscope to the Leica UFM4 comparison microscope currently in use by the Maryland State Police Forensic Sciences Division (MSP-FSD) as well as assessed whether the remote capabilities of the VisionX comparison microscope could streamline the confirmation process. Following the completion of performance checks designed to confirm that the VisionX comparison microscope functioned as described by the manufacturer, a series of projects were carried out that would evaluate the ability of the new VisionX comparison microscope to improve on the existing methodology established within the discipline.

The VisionX comparison microscope is a powerful addition to the Firearms and Tool Marks examiner’s toolkit. In its current form, the VisionX comparison microscope is able to be implemented into a forensic laboratory and provide several benefits in regards to operability and ergonomics. Further improvements in the VisionX software and its remote live display have the potential for making long distance live match determinations a reality.

Presenter Biography: Dr. Mark Dreyfuss is a Public Health Laboratory Scientist with the Mary State Police Forensic Sciences Division in Baltimore, Maryland. He received his doctorate from Walden University in Epidemiology and holds 2 masters degrees in public health and microbiology. Dr. Dreyfuss is a retired federal microbiologist and public health official and currently teaches microbiology at Baltimore City Community College.

Additional Research Contributors: Daniel E. Katz, MFS, Torin Z. Suber and Susan L. Kim, MFS
Physical Matching and Microscopic Comparison of Broken Knife Blades

Jaco Swanepoel

Abstract: Two sets of broken knife blade pieces, one set were the break originated at the knife tip end and another set were the break originated at the knife handle end were submitted for physical matching/microscopic comparison. Establishing that the various pieces from the two sets were once a single unit or blade was critical for evidentiary purposes.

Presenter Biography:

Jaco Swanepoel is a Criminalist with the San Francisco Police Department Firearms Unit and specializes in firearm and toolmark and shoe impression examinations. Mr. Swanepoel joined the South African Police Services in 1988 and joined the South Africa Police Services Criminal Record Center in 1989 after graduation from the Police College. Mr. Swanepoel performed duties as a forensic crime scene investigator, police photographer and fingerprint expert. In 1999 Mr. Swanepoel joined the South African Police Services Forensic Science Laboratory Ballistic Unit and performed duties related to firearms and toolmark examinations and forensic photography. Mr. Swanepoel immigrated to the United States in 2005 and joined Forensic Analytical Sciences, a private forensic laboratory in the Bay Area. While at Forensic Analytical Sciences Mr. Swanepoel performed duties in fingerprint, shoe impression, tire impression, crime scene reconstruction and firearms and toolmark examinations. Mr. Swanepoel has qualified to testify as an expert the courts of South Africa, California, Alaska, Nevada, Arizona and Florida.
Abstract: A2LA knows that accreditation is more common now within the forensic industry and we would like to provide further information on A2LA and what we can offer your laboratory. This presentation will include information on the following:

- Who is A2LA? An overview of our authority, structure and accreditation process
- ISO/IEC 27015:2017 - the standard updated and critical changes
- A2LA Workplace training classes
Uncertainty Budget Framework for Automated Firearms Identification

T.V. Vorburger

Since the Supreme Court’s Daubert Ruling in 1993, a prominent challenge in forensic science is providing a quantitative expression for the weight of the evidence as part of expert testimony, especially for pattern matching disciplines such as firearms identification. To address this challenge, we propose a prototype uncertainty budget framework for automated firearms identification in real case work. The uncertainty budget has four major components: measurement uncertainty, sampling uncertainty, modelling uncertainty, and uncertainty due to subclass characteristics. We describe scenarios for how the components of uncertainty may be quantified and then combined to yield an estimate of total uncertainty for a conclusion of identification, which is specified as a reasonable upper limit for the false positive error rate.

Presenter Biography:

Theodore Vorburger is a Guest Researcher in the Surface and Interface Metrology Group at the National Institute of Standards and Technology and a former Group Leader there. This group is responsible for surface roughness and step height calibrations, which underpin the U.S. measurement system for surface finish. During his tenure at NIST, Ted was co-leader of a project to develop standard bullets and standard casings for forensics laboratories and part of a team to assess the feasibility of a National Ballistics Imaging Database of new guns under a National Academies Project. He also led the development of a light scattering system for measuring surface roughness, and he collaborated in the development of the world’s first sinusoidal-roughness Standard Reference Materials. He is a member and former Chair of the American Society of Mechanical Engineers Standards Committee B46 on the Classification and Designation of Surface Qualities, a Subject Matter Expert for the equivalent Working Group under the International Organization for Standardization (ISO), and a member of the OSAC Firearms and Toolmarks Subcommittee. Ted has been working in Surface Metrology since 1976 and is the author or co-author of more than 200 publications in the fields of surface metrology, nanometrology, surface physics, atomic physics, chemical physics, and firearms topography research.

Additional Research Contributors:

Characterization of a Non-Linear Photometric Stereo Sensor Optimized for Fired Bullet Topography Capture

Serge Levesque

Abstract: The use of 3D surface topography capture for ballistic evidence has significantly grown over the last few years. 3D images routinely serve for the visual side-by-side comparison of suspected common source fired bullets and cartridge cases. This 3D topographic data is also commonly used for large database searches of potential links between firearm-related crimes and is essential for developing objective identification methods to quantify the strength of a match.

The value of the topographic data directly depends on its capacity to accurately represent the microscopic texture of the object’s surface on regions relevant for firearm identification. Other characteristics of the captured 3D topography or of the 3D sensor might benefit the expert, such as the sensor’s field-of-view (FOV) dimensions, its ease of use, and the duration of a topography capture.

We recently developed a new non-linear photometric stereo (NLPS) sensor for the 3D topography capture of fired bullets. We present characterization results obtained with this sensor.

Presenter Biography:

Serge Lévesque completed a Ph.D. from École Polytechnique de Montréal in 1998 in the field of laser atomic spectroscopy. In 2004, he joined the Research and Prototyping Group at Ultra Electronics Forensic Technology as a Senior Scientist where he developed original methods for the high-definition topography capture of bullets and cartridge cases. His work also includes the analysis of 2D and 3D images in the context of forensic firearm and tool mark identification.
No summer bucket-list is complete without a visit to First Tennessee Park for a Nashville Sounds baseball game. Escape for 9-innings of fun and prepare to catch a foul ball, indulge in the nation’s finest ballpark fare and take a selfie under the iconic guitar shaped scoreboard. Come cheer on the Triple-A affiliate of the Texas Rangers while enjoying an all-you-can-eat picnic on the private Party Porch reserved for AFTE attendees. Party Porch includes immediate access to The Band Box where you can enjoy several entertainment options such as ping pong, corn hole, pool, board games, table hockey and shuffleboard. Lounge on comfortable couches while taking in the backdrop of the Nashville Sounds ball club or watch the action on TV at the full service outside bar that specializes in refreshing frozen drinks such as the Jack and Coke Icee and the Field of Dreamsicles.

Picnic food includes: Hamburgers, Hotdogs, Pulled Pork, Coleslaw, Chips, Cookies, Soda, Water, Tea, Beer

Includes roundtrip bus transportation from the Gaylord Hotel to the ballpark located in downtown, Nashville. Busses will depart hotel at 5:00 to arrive at the park for the picnic at 5:35 pm. Game begins at 6:35 pm. Bus service will run continuously throughout the evening for those who wish to return early.
Schedule of Events
Thursday, May 30th

Registration
7:15 a.m. – 12:00 p.m.  Tennessee Ballroom Lobby A

Continental Breakfast
7:00 a.m. – 8:00 a.m.  Tennessee Ballroom Lobby A - Sponsored by Cyber National

Technical Session - Morning
Location: Tennessee Ballroom  Morning Moderator:  Jennifer Floyd

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## Technical Session - Afternoon

**Location:** Tennessee Ballroom  
**Afternoon Moderator:** Zach Elder

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Feasibility of Objective Identification for Inoperable Firearms

Michael Stocker

Abstract: Firearm and toolmark identification relies on the firearm’s unique individualizing toolmark surfaces that are created and remain during manufacturing. The random nature of these toolmarks are directly related to the type of manufacturing processes used to shape (e.g., milling, drilling, grinding) and finish (e.g., sanding, honing, blasting) these surfaces. Other factors, such as material build-up on the cutting tool and tool wear, will influence the random nature of their creation. For more than a century, firearms examiners have made their determinations of toolmark similarity based on visual examination through a comparison microscope. Today, the discipline is undergoing foundational changes as it moves towards implementing objective methodologies (based on 3D surface topography measurements), with the goal of supplementing an examiner’s testimony with objective similarity metrics and statistically supported error rates.

In casework, firearms examiners sometimes encounter situations where a suspect firearm is rendered inoperable to test fire. In these situations, an examiner may look at casts of the different toolmarking surfaces of the firearm to compare to evidence. Examiners know, for example, that breech face impressions on a test-fire and a cast of the firearm’s breech face will look qualitatively different overall, but individualizing markings exist on both to the extent that it is possible for an examiner to make an identification. Casting processes are known to accurately extract fine detail from surfaces they are replicating, in this case more detail from the breech face. How this additional detail affects a computer-aided determination of similarity (cast to test-fire) is an unanswered question. An experiment was conducted to study this issue. Casts of the breech face of a firearm were compared to test-fires from the same firearm. Three casts each of ten consecutively manufactured Smith and Wesson M&P9 slides were made. This presentation will evaluate how KM and KNM distributions of cast to test-fire comparisons appear relative to distributions from test-fire to test-fire comparisons for the same slides. Calculating an error rate for an inoperable firearm involves generating similarity scores from cast to test-fire comparisons. The effect of mixing similarity scores of one-to-one comparisons of casts to test-fires with similarity scores of test-fires only in a relevant background population will be statistically examined to understand its effect on generating this error rate. Some initial measurement and analysis of how the actual surfaces of the casts and test-fires differ will be shown.

Presenters Biography:
Michael Stocker is a Physical Scientist at the National Institute of Standards and Technology (NIST). His primary research areas focus on objective methods, procedures, and quality assurance for firearms and toolmark analysis. He is a technical advisor to AFTE.
The Use of Drone Imaging for Ejection Pattern, Trajectory, and Crime Scene Analysis

Adam Hartley

Abstract: Ejection pattern testing can be an arduous and time consuming process; plotting the distance and angle of many cartridge cases can fill up pages of notes and is prone to errors. Trajectory analysis with rods and string is difficult to document in a way that is useful for extracting meaningful measurements, especially when curved surfaces or uneven terrain is involved. Applying both of these techniques to a shooting incident reconstruction can be problematic. Photogrammetry can be used, however, as with all comparison quality documentation, images should be taken at 90-degrees to the subject in order to acquire valid measurements, but gaining access to the resources such as a helicopter or crane do this can be costly. UAVs (unmanned aerial vehicle) or drones with high quality cameras have recently started to become an affordable option to capture overhead orthogonal images for these analyses that can not only simplify the process, but also reduce the time and possible error of reconstructing a shooting incident. This presentation will demonstrate how using photogrammetry and drone imaging can be a practical approach of combining both ejection pattern and trajectory analysis to a crime scene reconstruction accurately and with as little math as possible.

Presenter Biography:

Adam has a BS in Scientific Imaging from RIT and a MS in Forensic Science from the University of New Haven. He has been performing image analysis in the micro and macro world for the past 20 years at Albert Einstein College of Medicine and Yale University as a microscopist and independently as a forensic examiner. He has had many publications in both books and journal articles, and has presented several times at AFTE and other regional conferences.
A Profile/Image Reconstruction Method For Objective Comparison of Deformed Bullets

J. Song, R.M. Thompson, Z. Chen, J.A. Soons, and M.E. Nadal

Abstract: Most laboratory studies on computer-aided bullet comparisons address pristine bullets. However, evidence bullets found at a crime scene may be deformed or fragmented, with resulting distorted striation signatures on the Land Engraved Areas (LEAs) or missing LEAs, which may decrease the comparison score of same-source bullets.

To overcome this challenge, two modifications were applied:

1) A profile/image reconstruction algorithm is designed to straighten the striation signatures with distortion

2) A congruent matching profile segments (CMPS) method is utilized to obtain an objective comparison score between the extracted profiles from the LEAs. The CMPS method was developed at NIST to address the possible presence of invalid (poorly marked) correlation areas and lateral scale distortions on a profile.

For deformed bullets with good stria visibility, the proposed profile/image reconstruction method can straighten the curved LEAs. Combined with the CMPS comparison method, the correlation results for these bullets can be significantly improved.

Presenters Biographies:
The authors are members of the Project Team on Forensic Topography and Surface Metrology at NIST. J. Song, J.A. Soons and M.E. Nadal are from the Sensor Science Division (SSD); R.M. Thompson is from the Special Program Office (SPO), Z. Chen is a guest researcher from the Harbin Institute of Technology (HIT) in China.
Frangible Ammunition: Past and Present

Lucien C. Haag

Abstract: In recent years there has been a renewed interest in frangible rifle and pistol ammunition which has extended well beyond its use in indoor ranges and now includes personal protection, training ammunition and ammunition for law enforcement entry guns.

All of the bullets in the contemporary cartridges are lead-free which is, in part, the motivation for the recent development and marketing of this ammunition.

The composition of most, but not all, of the modern frangible bullets fall into two categories; powdered copper in a polymer matrix (usually a Nylon-based polymer) or sintered mixtures of powdered copper and tin. At least one unique composition consists of a sintered mixture of powdered iron and zinc.

As a result of these lead-free compositions, the weights of these bullets are consistently less than those in the original loadings with traditional bullets. The lighter bullet weights often result in higher muzzle velocities, and always reduced ballistic coefficients.

This presentation will briefly review the history and development of frangible ammunition followed by the exterior and terminal ballistic performance of these bullets. Several methods for differentiating the two types of manufacturing will be presented.

Finally, the very troublesome matter of firearms identification associated with these projectiles will be illustrated.

Presenter Biography:

Lucien C. “Luke” Haag is a former Criminalist and Technical Director of the Phoenix Crime Laboratory [1965-1982] with over 53 years of experience in the field of criminalistics and forensic firearm examinations. He is a Distinguished Member and past-president of AFTE, a Distinguished Member of the California Association of Criminalists, a member of the Southwest Association of Forensic Scientists, a Fellow in the American Academy of Forensic Sciences and a past board member of the International Wound Ballistics Association. He is a frequent contributor to the AFTE Journal and co-author of the textbook, Shooting Incident Reconstruction. Luke Haag has received the AFTE Key Member Award on three occasions during his many years of participation in AFTE seminars.
Improved Algorithm-Based Cartridge Case Comparison, Towards a Statistical Model

Ryan Lilien and Eric Meschke

Abstract: 3D Virtual Comparison Microscopy (VCM) refers to the analysis of digitally measured 3D surface topographies viewed on a computer workstation. VCM includes both examiner-based comparison and algorithm-based quantitative scoring. This presentation will focus on algorithm-based scoring and will include important concepts and experimental results. The information will help examiners use VCM comparison algorithms more effectively.

To be most effective, scoring algorithms should be explainable, interpretable, and have statistical meaning. Explainability refers to the ability to describe, in general terms, the general principles on which the algorithm operates. Interpretability refers to the ability to describe, for a specific comparison, why the algorithm output a specific numeric score and the significance of the computed score. Statistical Meaning refers to the ability of an algorithm to produce the same results on repeat analysis, which are comparable across runs and on which a measure of statistical confidence can be assigned.

Algorithms that demonstrate all three criteria (explainability, interpretability, and statistical meaning) will be the most useful to the firearms examiner and the criminal justice system. In this presentation we will introduce these three concepts, describe our updated comparison algorithm, and present matching results on over 5000 cartridge cases (several million pairwise comparisons).

The results of this study strongly support the use of our 3D Virtual Comparison Microscopy comparison algorithm as a viable method to facilitate source conclusions.

Biography of Presenters:

Ryan Lilien, MD/PhD.
Ryan's research expertise focuses on the use of advanced scientific computing and statistical models to solve interdisciplinary research problems. Ryan earned an MD/PhD from Dartmouth Medical School and Dartmouth's Department of Computer Science. Ryan was faculty at the University of Toronto cross-appointed between Computer Science and the Faculty of Medicine. He has received research funding from the Gates Foundation, NIJ, NIST, and Canada’s National Sciences and Engineering Research Council. He is now located in Chicago and serves as Cadre Research’s head of research and development while maintaining an adjunct appointment at the University of Toronto. Ryan leads development of the TopMatch-3D High-Capacity system (a 3D imaging and analysis system for firearm forensics and virtual microscopy). He’s presented his group’s steady progress on developing and validating the system at recent national and regional AFTE meetings. Ryan is also currently a member of NIST’s OSAC (Organization of Scientific Area Committees) Subcommittee on Firearms & Toolmarks.

Eric Meschke, MS.
Eric is a Software Engineer who has worked in large-scale data analysis for over ten years. He has a Masters Degree in Computer Science and a second Masters in Mathematical Finance. At Cadre, Eric is part of the algorithm research group and he works on assessing algorithm performance as well as improving comparative methods.
Results of the 2018 3D Virtual Comparison Microscopy Error Rate Study (VCMERS)

Ryan Lilien and Todd Weller

Abstract: This presentation will teach the audience about Virtual Comparison Microscopy (VCM) and present the results from the 2018 VCM Error Rate Study (VCM-ERS) completed as a collaboration between Cadre and the Royal Canadian Mounted Police (RCMP) National Forensic Laboratory Service.

The 3D VCMER Study was conducted in 2018 by Cadre Forensics (Chicago, Illinois) and the Canadian RCMP (Ottawa, Ontario, Canada). The study focused exclusively on virtual comparison microscopy of cartridge cases. Forty test sets each containing three cartridge cases (two “known” and one “unknown”) were created. The selected test sets represent a variety of tool manufacturing/finishing processes and class characteristics. The sets include both cartridge cases that are well marked and those that are minimally marked. The sets range in difficulty, from easy to hard, to represent the variability experienced in real casework. The 3D surface topographies of all scans were collected using Cadre’s TopMatch-3D scanning system at a resolution of approximately 1.5 micrometers per pixel. Each participant was randomly and blindly assigned sixteen different test sets to evaluate. Only breech-face impressions (and aperture shear when present) were used during the comparisons. For each test set, participants were asked both to reach a source conclusion (utilizing the 5 Point AFTE range of conclusions) and to annotate areas of similarities and differences that were used when reaching their conclusion.

A total of 107 participants completed the study, including 63 in the United States. Participants reached 1712 source conclusions. In this presentation we will describe overall study results and error rates. Results will be broken-down by test set and toolmark class. Presented results will include our summary annotation maps, which are visual topographic overlays indicating the percent of participants that utilized each portion of the 3D surface when reaching their conclusion. Initially introduced in 2016, these annotation maps provide unprecedented insight into the examiner decision process and highlight the degree of consistency demonstrated by examiners.

The results of this study strongly support the use of 3D Virtual Comparison Microscopy as a viable alternative to traditional light comparison microscopy within the discipline of firearm examination.

Biography of Presenters:

Ryan Lilien, MD/PhD.
Ryan’s research expertise focuses on the use of advanced scientific computing and statistical models to solve interdisciplinary research problems. Ryan earned an MD/PhD from Dartmouth Medical School and Dartmouth’s Department of Computer Science. Ryan was faculty at the University of Toronto cross-appointed between Computer Science and the Faculty of Medicine. He has received research funding from the Gates Foundation, NIJ, NIST, and Canada’s National Sciences and Engineering Research Council. He is now located in Chicago and serves as Cadre Research's head of research and development while maintaining an adjunct appointment at the University of Toronto. Ryan leads development of the TopMatch-3D High-Capacity system (a 3D imaging and analysis system for firearm forensics and virtual microscopy). He’s presented his group’s steady progress on developing and validating the system at recent national and regional AFTE meetings. Ryan is also currently a member of NIST’s OSAC (Organization of Scientific Area Committees) Subcommittee on Firearms & Toolmarks.

Todd Weller, MS.
Todd has been a Criminalist for over 17 years. He worked for the Oakland Police Department for 16 years and is now in private practice. He has performed casework in drug analysis, DNA, crime scenes, and for the past nine years has worked in the firearms identification specialty. He graduated from the National Firearms Examiner Academy (NFEA) in 2009. Todd has a BA in biochemistry/molecular biology from Dartmouth College and a MS in forensic science from the University of California, Davis. For his master’s thesis, Todd collaborated with NIST to study confocal microscopy on test fires from consecutively manufactured firearms. Todd is currently the Chair of NIST’s OSAC Subcommittee on Firearms & Toolmarks.
Pressure Factors In Cartridge Case Comparison
c
James Hamilton and Dr. Keith Morris

c
Abstract: This presentation will evaluate the variability in breech face and firing pin correlation scores based upon differences in the loading conditions of the cartridges observed.

c
Gaining a better understanding of the factors that influence the development of breech face and firing pin impressions will provide insight into their variability within a firearm. The interaction of the primer and breech face is determined by the chamber pressure generated in a single firing event, variables such as powder type, charge weight, and seating depth of the projectile all play a role in the maximum pressure generated during discharge.

c
Aside from the chamber pressure, primer specifications may also affect the quality (and quantity) of the impressions transferred to the primer and cartridge case. Manufacturing specifications (such as metal hardness and the presence or absence of coatings) and the manufacturing processes vary between manufacturers. The ability of the primer to receive impressions based on these specifications also plays a role in impression development.

c
The primary objective of this research project is to investigate the role each of these factors play in the development of breech face and firing pin impressions as well as the affect they have on IBIS correlation scores and the congruent matching cells. This is achieved by reloading ammunition and manipulating each of the previously discussed variables. The cartridges are then fired through a single firearm and collected for comparison using a Generation 1 IBIS Heritage System. Three-dimensional scans collected using a Sensofar S Neox confocal microscope are analyzed using the National Institute of Standards and Technology (NIST) newly developed Congruent Matching Cells (CMC) method. This presentation will show the effect of comparing breech face and firing pin impressions developed by a single firearm from cartridges under similar and varying loading conditions. The results of IBIS and CMC analysis will be presented with match and non-match distributions shown based on primer manufacturer, powder type, and charge weights. The analysis conducted from this study will provide a better understanding of the variability of breech face and firing pin impressions within a single firearm system and provide insight into the affect variables within the system have on their development.

c
The authors would like to acknowledge the National Institute of Justice (NIJ) for the funding of the project through NIJ award 2017-DN-BX-0161.

Presenter Biography:

James Hamilton received a BS, MS and is currently pursuing a PhD in Forensic and Investigative Science at West Virginia University. His research interests focus primarily on the development of breech face and firing pin impression evidence and the variables that affect them.
Firearms ID by Acoustic Signals of Firearms Mechanism Operation

Pavel Giverts

Abstract: The amount of video and audio evidence in police case work has increased significantly due to the prevalence of recording devices. In addition to security cameras, many people use mobile devices that have high-quality cameras and microphones. As a result, in more and more cases, the firearms used on the crime scenes are recorded and the records are available for investigation. In some of these records the sound has more information than the picture.

During the operation of firearms different sounds are made. The sound of a shot, the sound of a flying bullet, and the sound of the bullet’s impact have all been well investigated. However, less attention has been given to the sound of mechanical operation of firearms. This presentation demonstrates that different types of firearms produce different acoustic signals. Moreover, signals which are made by the same firearm during different operations are different. These acoustic signals can be analyzed, compared and identified in a few ways.

This research proves that the presented method of analysis of acoustic signals made by firearms can be used in forensic identification.

Presenter Biography: Pavel Giverts has worked as Firearms examiner for the Israel police since 1999. He has an engineering degree (M.Sc.) in mechanical engineering from Ukrainian University and M.Sc. degree in mechanical engineering from Ben-Gurion University in Israel.

Trajectories from Single Impact Sites – The Lead-In/Rocker Point Method

Michael Haag

Abstract: One of the primary factors that greatly affects the deflection of a bullet is the angle of impact with the surface it strikes. One way to visualize this is by imagining a projectile perforating a piece of drywall orthogonally. This situation will induce minimal deflection, however, as the angle of impact decreases, the observed deflection of the bullet from the original path increases. At a point, depending on the speed and mass of the bullet, the hardness of the material struck, and the angle of impact, the bullet will cease perforation, and, instead, ricochet from the surface. One of the problems for the reconstruction of the trajectory, is that at such shallow angles, when deflection can quickly change the path of the bullet, a secondary, or downrange impact is no longer the proper point to use in order to establish the original trajectory of the bullet. This means that a trajectory rod placed in the usual manner, from primary impact to secondary, may not be representative of the original path of the bullet, and therefore not point accurately to the location of the firearm when discharged.

At angles of impact close to 30 degrees and less, the mark known as the “lead in mark” will become apparent as a parabolic shape. This is created by the side of the projectile as it rubs and depresses the impact material. This mark can be used in determining direction of travel, but it can also play an important role in the reliable determination of the initial trajectory of the projectile. Because there is potential for significant deflection of projectiles while perforating materials at shallow angles, this lead in mark can be used in association with a trajectory rod to reliably demonstrate the original, undeflected path of the bullet and therefore aid in determining the location of the firearm at the time of discharge. The use of the end of a trajectory rod with the lead in mark area, has also been referred to as the “rocker point” method.

This paper will review the past documentation and history of this simple technique, demonstrate when it is applicable, describe the methodology behind it, and demonstrate its reliability from experimental trials.

Presenter Biography: Michael Haag is a private consultant owning his own company, Forensic Science Consultants, and a Supervising Forensic Scientist with the Albuquerque Police Department. His primary area of expertise is shooting incident reconstruction. He has been active in the field for about 20 years and is a distinguished member of AFTE.
European Distribution and Occurrence of Firearms Ammunition (EDOFA)

Jan De Ceuster

Abstract: EDOFA is a database developed in 2018 with financial support of the European Union. It is intended to be used by the European Network of Forensic Science Institutes (ENFSI). Although local databases, containing technical data from firearms and ammunition, exist in the majority of the individual European countries, this information was not systematically shared. While the FBI’s GRC remains a helpful source, a database containing rifling data of firearms used in Europe would yield more meaningful results for the European examiner. It became evident that firearms and ammunition distribution and occurrence in Europe is not homogeneous. It was therefore interesting to have a tool to assess the rarity of evidence based on class characteristics. The relative data for this assessment is casework technical data gathered from actual seizures. A calculation tool called the Frequency of Occurrence (FoO) was developed to assess evidential strength. Geographical chronological filtering capabilities have been implemented.

This presentation gives an overview of the most important design features of the database such as the introduction of new data, the search and filter possibilities for rifling characteristics and shot gun ammunition as well as the calculation of the Frequency of Occurrence including the mapping tool.

Presenter Biography:

Jan De Ceuster obtained a Master’s degree in Physics in 1998 and a PhD in Science in 2003 from the University of Antwerp, Belgium. He has been working as a forensic firearms expert for the Belgian government in the NICC since 2003. Jan’s main fields of investigation include firearms and ammunition examination, comparative analysis and shooting incident reconstruction, including 3D laser scanning. Jan De Ceuster is distinguished member of AFTE and is currently a member of the steering committee of the Expert Working Group Firearms / GSR of the European Network of Forensic Science Institutes (ENFSI). Jan De Ceuster acted as the activity lead for the development of the EDOFA database together with eight other European colleagues in this EU funded project.
Determining Time Since Discharge of Firearms Using A Thermal Imaging Device

Ashley Martin

Abstract: The question of, “When was this firearm fired?” has long been asked, but has rarely been answered. Previous research conducted used various methods to answer this question, but these methods did not persist or expand into use in the United States. With the availability and advancement of thermal imaging devices, a new method to attempt to determine when a firearm was last fired presented itself.

The research presented here hypothesized that if temperature measurements from a recently discharged firearm could be used in correlation and comparison to additional data (such as firearm type and number of shots fired), then a time estimate of when the firearm was discharged could be attained or extrapolated.

Preliminary research experiments were conducted to initiate this line of research and to further establish feasibility. A set of proof of concept trials were performed to examine and establish variables that would be valuable to examine during this stage of research and to narrow the area of focus for this project. For this research project, the author set out to examine the heat decay of different firearm types, and subsequently the effect of varying magazine capacities on the heat decay of each firearm used, to attempt to estimate time since discharge.

A thermal imaging device, specifically a forward looking infrared (FLIR) device connected to the author’s smartphone, was used to estimate temperature measurements that were recorded after each firearm was fired with varied magazine capacities. Different firearm types were selected to represent each type of firearm, as well as the most common make and caliber seen in the author’s laboratory. This allowed for the comparison and examination of differences and similarities between the rate of heat decay in firearm type and magazine capacity.

The temperature measurements were used to create a mathematical model for each firearm type, as well as for each magazine capacity examined. The overall results showed a distinct difference between the heat decay and the initial heat generated based upon the number of shots fired. The mathematical models generated were further applied to a test set of unknown trials. Ultimately, as expected, the more shots fired from a firearm lead to greater heat generated and thereby, a more reliable and consistent heat decay. This allows for valuable data extrapolation and generation of viable mathematical models for use in estimating time since discharge for select firearms used in this research.

In conclusion, while this research is merely a starting point for attempting to establish methods for determining time since discharge, the results show potential for use in forensic applications.

Presenter Biography:

Ashley Martin is a Firearm and Tool Mark Examiner at the Albuquerque Police Department Crime Laboratory in Albuquerque, NM. She began her career in Albuquerque in 2016 and is a 2018 graduate of the National Firearms Examiner Academy.
Schedule of Events
Friday, May 31st

Workshops (See pages 91-93 for details)

Morning Workshops

8:00 a.m. – 10:00 a.m.  Forensic Double Casting: Best Practices
                        Paul Murphy

8:00 a.m. – 12:00 p.m. Serial Number Restoration
                        Jennifer Owens

8:00 a.m. – 12:00 p.m. Ammunition for the Firearms Examiner
                        George Kass

8:00 a.m. – 12:00 p.m. Ammunition Identification
                        Axel Mathei

Full Day Workshops

8 a.m. – 5:00 p.m.    Springfield XD\XDm Armorer’s Course
                        Gary Monreal

8 a.m. – 5:00 p.m.    Machine Guns and Clandestine Conversions
                        Daniel O’Kelly

8:00 a.m. – 5:00 p.m. Bullet Deflection as a Result of Perforation
                        Michael Haag and Lucien Haag

5:00 p.m. – 8:00 p.m.  5.11 Night
Sunday, May 26th, 2019

**Subclass Characteristics**

**Instructor:** Nancy D. McCombs  
**Course Cost:** $50.00  
**Time:** 8:00 AM – 12:00 PM  
**Location:** Cheekwood F

This workshop will introduce students to methods of recognizing potential subclass characteristics. A wide variety of firearm and tool mark manufacturing processes will be evaluated for subclass carry-over potential. Participants will discuss lab practices with an emphasis on documenting potential subclass characteristics in casework.

**Assisting the Firearms Examiner Prepare for an ANAB Accreditation (17025:2017 and AR3125)**

**Instructors:** Julie Knapp and Amy Weber  
**Course Cost:** $40.00  
**Time:** 8:00 AM - 12:00 PM  
**Location:** Cheekwood G

This course will guide examiners on how they can prepare their laboratories for ANAB assessments based on the new accreditation requirements, ISO 17025:2017 and AR 3125. Examples of how laboratories have addressed the new requirements will be shared as well as ways to address the challenges the firearm and toolmark community are facing with regards to the new ISO standards. This course was developed by ANAB firearm/toolmark technical assessors to pass on general, constructive knowledge for the firearm/toolmark examiner on how to best prepare for an assessment.

**HI-Point Firearms Armorer Course**

**Instructor(s):** Brian Smelser and Chris Monturo  
**Course Cost:** $55.00  
**Time:** 8:00 AM - 12:00 PM and 1:00 PM – 5:00 PM  
**Location:** Magnolia Boardroom B

Instructor(s): Brian Smelser - Washington State Patrol, Chris Monturo - Miami Valley Regional Crime Lab  
**Time:** 1pm-5pm  
**Cost:** $55

This course will discuss the HI-Point product line as well as assembly/disassembly, serial number system, and the manufacturing processes utilized by the company. There will be a hands-on portion of the course using actual HI-Point firearms.

**Attendees:** Please bring eye protection
Best Practices for Using the VisionX Comparison Microscope for Firearm and Toolmark Examination

Instructors: Paul Murphy and Kristina Godin
Course Cost: $35.00
Time: 9:00 AM - 12:00 PM
Location: Cheekwood B

The Projectina VisionX comparison microscope brings a revolutionary design to firearm and toolmark examination. With exceptional craftsmanship and superior optics, designed with industry best practices and the examiner’s workflow in mind, VisionX is more than a comparison microscope - it’s a solution dedicated to helping you solve more crime.

This workshop will discuss best practices using the VisionX, including basic and more advanced software features, and will demonstrate using Remote Collaboration for remote examination - this cooperative environment can accelerate the lead generation process and increase collaboration across borders.

Location:

PhotoGUNmetry

Instructors: Kristen Drury and Aaron Brudenell
Course Cost: $50.00
Time: 12:00 PM - 5:00 PM
Location: Cheekwood F

Working in the digital age, it is important to stay on top of the latest and greatest techniques, tips, and tools of the trade to accomplish the common good of the order. There is a trend of growing sources of imagery and video recording individuals and incidents involving firearms available for analysis. Collaboration with multiple forensic specialties and crime Intel analysts can assist in the investigation of various types of criminal enterprises. This course takes an in-depth look at the systematic analysis of video and still images produced in critical incidents and on various Open Source Media / Social Media platforms and/or surveillance / witness recording devices to produce investigative leads and details that otherwise would be lost in the pixels. This course reviews the importance of supplemental documentation, case approach and the limited universe in which we all live and operate. Topics to be covered include:

• Systematic case approach
• Supplemental notes and documentation
• Research
• Firearms reference collections
• Investigative leads / Long term investigations

Attendees: Please bring laptop with MS Word and a program to view video and photos
Location:
New BULLETTRAX Hands-On Session
Instructors: Andrew Boyle and Michel Paradis
Course Cost: FREE
Time: 1:00 PM - 5:00PM
Location: Cheekwood G
Drop in for a hands-on interactive demonstration of the latest evolution in high-definition 3D bullet acquisitions with the new IBIS BULLETTRAX. Participants will see first-hand how fast and easy bullet acquisitions can be, whether the bullet is a pristine test fire or deformed from damage, and then complete their analysis using MATCHPOINT’s comparison tools.

Come in during Sunday afternoon to experience your session with the new IBIS bullet solution.

Those who partake will have their names entered for prize drawings that will take place during the Wednesday afternoon break.

Contemporary Issues in Firearms Identification
Instructors: Ron Nichols and Andy Smith
Course Cost: $55.00
Time: 8:00 AM - 5:00 PM
Location: Cheekwood H
In recent years firearms identification has come under increased scrutiny from various sources including academics, courts, newspaper articles, magazine articles, and federally funded studies. It is important to be aware of these areas of concern being addressed because these criticisms and critiques are being brought up in court proceedings across the country. It behooves any practicing firearm and tool mark examiner to be intimately aware of these issues and be prepared to discuss what impact they have or do not have on their daily work.

This workshop is designed to give the attendee an overview of the most contemporary issues facing the firearm and tool mark examiner community. Not all issues will be discussed, only the ones that are most frequently seen being brought up in court proceedings and in the literature. The workshop will be constructed in a lecture and question / answer format. The attendees will receive instruction and materials on four (4) different contemporary issues. During each of the four separate lectures class participation and discussion periods will be integral to the success and knowledge gained from the workshop.

Understanding the Math of Bullet Path Analysis
Instructor: Matthew Noedel
Course Cost: $75.00
Time: 12:00 PM - 5:00 PM
Location: Cheekwood B
This 1/2 day workshop will focus on the use of trigonometric formulas to document and solve horizontal and vertical aspects of bullet path analysis. In some circumstances, use of traditional trajectory rods, lasers or other techniques to determine bullet paths may not be feasible. Using the location and position of primary and secondary impact points (measured by hand or other techniques), students will learn how to apply the formulas to solve the appropriate angles and then use these values in scene reconstruction. A lecture followed by practical hands on examination of simulated bullet paths will be used to teach these principles. Students are encouraged to bring a scientific calculator, cameras and note taking material.
Implementation and Practical Applications of 3D Technology, Analysis, and Statistics for FA/TM Examinations

Instructors: Xiaoyu Alan Zheng, Thomas Brian Renegar, Michael Stocker, Johannes Soons, Nicholas Petraco, Ryan Lilien, & Erich Smith

Course Cost: $60.00
Time: 8:00 AM - 5:00 PM
Location: Cheekwood C

This full day workshop provides foundational knowledge and real world applications of emerging research, tools and automated technologies for firearm and toolmark analysis. National Institute of Standards and Technology (NIST) will provide an overview of the direction and methodologies currently being employed in FA/TM research as well as future roles that the technology can be utilized. A case study will be presented on how the FBI Laboratory Firearms/Toolmarks Unit (FTU) has been evaluating 3D technologies, validation, incorporation into casework, and mapping out challenges that laboratories could face with implementation. Attendees will also have an opportunity to participate in several CTS style tests using virtual comparison microscopy to learn about its utility in every day casework. Topics Include:
• Intro and Technology Landscape
• 3D Measurement Principles
• Measurement Quality
• Computer-aided Firearm and Toolmark Identification
• Statistical Framework
• Virtual Microscopy (VM)
• FBI FTU Validation and Implementation of VM into Casework

Distance Determination

Instructors: Adam Grooms and Erica Lawton
Course Cost: $125.00
Time: 8:00 AM - 5:00 PM
Location: TBI

This workshop is designed to give the student an overview of different aspects related to the examination process in distance determination cases. Utilizing a combination of lecture, case examples, and practical exercises, participants will be exposed to the visual, chemical and instrumental methods that are used during the examination process. Topics covered will include: history, proper case notes, visual and chemical analysis, incorporation of instrumental processes, conclusions and results, unique situations, uncertainty of measurement, and courtroom testimony. (Lunch provided)

Attendees: Please bring eye protection and lab coat
Subclass Evaluation and Documentation

Instructors: Mike Neel, Eric Freemesser, and Eric Collins

Course Cost: $75.00

Time: 8:00 AM - 5:00 PM

Location: Cheekwood A

This workshop is designed to develop or improve an examiner's ability to confidently evaluate toolmarks and tool working surfaces for the presence or absence of potential subclass characteristics.

This workshop will include the following:

1. a brief background of the course development
2. a review of current criticisms targeting the ability of FA/TM examiners to recognize and evaluate subclass characteristics
3. a listing and review of forensic literature on subclass characteristics
4. a discussion of various manufacturing and finishing processes and their relative potential for subclass carryover
5. methodology for evaluating subclass potential when a tool/firearm is available for examination
6. methodology for evaluating subclass potential when a tool/firearm is not available for examination
7. suggested methods of documentation and reporting; and 8) practical exercises to reinforce all concepts
Tuesday, May 28th, 2019

**Barrett Manufacturing Tour**
Course Cost: $100.00
Time: 7:00 AM - 12:00 PM
Location: Location and transportation information will be provided during Monday’s Technical Session announcements.

Headquartered in Murfreesboro, Tennessee, Barrett is the world leader in large-caliber rifle design and manufacturing. Their products are used by civilian sport shooters, law enforcement agencies, the United States military and more than 73 State Department approved countries across the world.

**Power and Passion: Who Killed Angel Downs??? Staged Crime Scenes**

Instructor: Jan Johnson
Course Cost: $45.00
Time: 8:00 AM - 12:00 PM
Location: Cheekwood C

Angel Downs, a beautiful, blond, 45-year old Real Estate Agent whose friends called her “Barbie,” had everything live for until one summer evening in 2010 her body was discovered on the drive-way of her residence with a single fatal gunshot wound to her head. Her boyfriend, a celebrity politician had a six-year relationship with Angel while he was married. He became a prime suspect in her death. This presentation involves the original investigative interview with suspect and forensic evidence presented during the trial. This case has all sorts of twists and turns so come help solve the puzzle to get to the final closure of the case. It is an exciting case for your forensic archives.

**Machining for the Firearm/Toolmark Examiner**

Instructor: Chris Monturo
Course Cost: $80.00
Time: 8:00 AM - 12:00 PM
Location: Cheekwood B

This workshop will provide firearm examiners with an introduction to the various machining methods used in the manufacturing of firearms. In addition to the machining methods, an in depth review of the processes of creating the tools and associated marks (class, potential subclass, and individual) produced by those tools will be discussed. Topics will include: Milling Machine, Broaching, Lathe, Stamping, EDM, Metal Injection Molding, and Grinding. Additionally, there will be a literature review of the effects of machining from a variety of academic sources.

**Beretta Manufacturing Tour**

Course Cost: $100.00
Time: 8:00 AM - 12:00 PM
Location: Location and transportation information will be provided during Monday’s Technical Session announcements.

Beretta is the worlds’ oldest and largest manufacturer of small arms and partner of many international Defense and Law Enforcement agencies. Tour the manufacturing plant in Gallatin, Tennessee. Tour includes machining processes for production of pistols, rifles and shotguns.
Quantofix Nitrite Workshop
Instructors: Jill Kurzenberger and Evan Thompson
Course Cost: $50.00
Time: 8:00 AM - 12:00 PM
Location: Cheekwood F

Several problems exist with the currently employed Modified Griess Test:
• The limited availability of glossy photographic paper
• The ever-changing chemistry of the emulsion layer on inkjet photo paper
• The preparation time required to treat the paper(s)
• The exposure to the chemicals necessary to prepare the paper(s)

A solution to each of these points has been successfully tested for detecting the presence of nitrites: a new pre-treated, ready-to-use paper called Quantofix Nitrite Sheets. The nitrite sheets will be utilized by attendees to test the presence of nitrites, produced by gun fire, on white cotton twill cloth, denim cloth, printed cloth, sheet metal (car), painted drywall (inside structure material) and wood (siding). Additionally, attendees will be given hands on training utilizing two methods for developing the nitrite sheets; an acetic acid solution, and purified water.

2nd Annual NIBIN Users Group Round-Table Meeting
Instructor: Stacy Stern, Sharon Buchanan, Michel Paradis
Course Cost: FREE
Time: 12:00 PM - 1:30 PM
Location: Cheekwood A

The 2nd Annual NIBIN Users Group Round-Table Meeting, hosted by ATF and Ultra Electronics Forensic Technology, will be an interactive session with representatives from agencies who participate in the ATF NIBIN program. The session will include a brief update on the NIBIN Program, a review of the already implemented Minimum Required Operating Standards (MROS), a discussion on the most recent MROS evaluations, and an overview of upcoming changes to IBIS. The session will be a round-table style discussion enabling attendees to provide feedback, ask questions and discuss all NIBIN-related program topics.

Attendees must either have an active NIBIN User account or directly supervise personnel who perform IBIS acquisitions and/or correlation reviews.

Lunch will be provided and seating is limited.

Beretta Manufacturing Tour
Course Cost: $100.00
Time: 1:00 PM - 5:00 PM
Location: Location and transportation information will be provided during Monday’s Technical Session announcements.

Beretta is the worlds’ oldest and largest manufacturer of small arms and partner of many international Defense and Law Enforcement agencies. Tour the manufacturing plant in Gallatin, Tennessee. Tour includes machining processes for production of pistols, rifles and shotguns.
Recognizing an 80% Lower (Pistol and Rifle Platforms) in Casework

Instructors: Jaimie Smith, Joseph Young, Edward Gesser, and Kristina Cheung
Course Cost: $125.00
Time: 8:00 AM - 4:00 PM
Location: Cheekwood G

This workshop will provide information on the 80% lower receivers for both pistols and rifle platforms. It will include legal information/ramifications, recognizing a 80% lower in casework, available manufacturers, different methods of manufacture, advantages/disadvantages to different methods of manufacture, the process of converting an 80% lower to a fully functioning firearm, equipment necessary to achieve a functioning firearm, a cost comparison to purchasing a functioning firearm, and potential reasons to purchase this type of firearm. During the workshop, examples of the receivers at different stages throughout the manufacturing process will be available, as well as videos explaining how it was done. Finally, there will be a practical hands-on assembly and test firing the assembled firearms at a range.

Attendees: Please bring eye and ear protection

* All participants must be affiliated with law enforcement or a government entity.

M1911A1 Armorer’s Course
Instructor: Joe Daniels
Course Cost: $150.00
Time: 8:00 AM - 5:00 PM
Location: Cheekwood H

The M1911A1 Armorer’s Course is an eight hour course that covers the nomenclature, operation and repair of the M1911A1 Pistol. Upon completion the student will be able to safely operate, disassemble, function check and perform armorer level maintenance on the pistol. They will also be able to inspect the firearm to ensure that it can be safely operated.

Attendees: Please bring eye protection
AR-15 / M-4 Armorer’s Course
Instructor: Greg Lee
Course Cost: $150.00
Time: 8:00 AM - 5:00 PM
Location: Magnolia Boardroom B

AR-15/M-4 Armorer's Course is an eight hour course that covers the nomenclature, operation and repair of the AR-15/M-4 weapon system. Upon completion the student will be able to safely operate, disassemble, function check and perform armorer level maintenance on the AR-15/M-4 system. They will also be able to inspect and gauge the firearm to ensure that it can be safely operated. This course has specifically modified for the forensic firearms examiner.

Attendees: Please bring eye protection

Fort Scott Munitions

Our LE DEFENSE rounds are manufactured out of the finest brass bar we can get our hands on, which gives our LE ammunition an advantage over anything your target can send your way. The LE line is designed to be Barrier Blind and if need be can penetrate vehicles, hard surfaces, walls, and body armor. Our LE rounds will even penetrate tough laminated windshield glass and still maintain 98% of its mass without lowering accuracy.

Interested in a LE Demo?
Contact us at LEDEMO@FORTSCOTTMUNITIONS.COM
Or call us at 1.877.526.1903
Barrett Manufacturing Tour
Course Cost: $100.00
Time: 7:00 AM - 12:00 PM
Location: Location and transportation information will be provided during Monday’s Technical Session announcements.
Headquartered in Murfreesboro, Tennessee, Barrett is the world leader in large-caliber rifle design and manufacturing. Their products are used by civilian sport shooters, law enforcement agencies, the United States military and more than 73 State Department approved countries across the world.

Road-Mapping Documentation for Shooting Reconstruction
Instructor: Jan Johnson
Course Cost: $60.00
Time: 8:00 AM - 12:00 PM
Location: Cheekwood C
Crime scene documentation of shooting incidents is often lacking in methodical documentation for purposes of reconstruction. This shooting incident workshop will cover many forensic road-mapping techniques for detailed crime scene documentation. It will also cover road-mapping documentation of individual items of evidence to include bloodstain pattern analysis within your shooting scene. Workshop attendees will map mock targets with a variety of shooting and bloodstain patterns. Also, the attendees may test their skills by identifying the created bloodstain patterns.
Safety Note: Aprons, gloves, safety glasses, and masks will be provided for students enrolled in this workshop. Non-human blood will be utilized for the experiments. Please bring your camera if you wish to document these experiments.

Class Characteristics of Toolmarks in Bone and Cartilage
Instructor: Brian Smelser
Course Cost: $55.00
Time: 8:00 AM - 12:00 PM
Location: Cheekwood A
Dismemberment and other toolmark cases related to bodies occur regularly and sometimes we are asked about the types of saws, if they were hand or power tools, and other questions. Often, we haven’t taken the time to make cuts in bone to see what those class characteristics are. During this workshop, we will look at class characteristics of saws (and other tools), their marks in bone, and knives in cartilage. We will look at casting and preserving the toolmarks, discussing issues related to different types of substrates of the toolmark, and prepare tests for comparison purposes.

Slide Fire Familiarization
Instructors: Joseph Young, Jaimie Smith, Edward Gesser, and Kristina Cheung
Course Cost: $80.00
Time: 9:00 AM - 12:30 PM
Location: Location and transportation information will be provided during Monday’s Technical Session announcements.
Familiarize yourself with the Slide Fire system:
• How Slide Fire works
• How Slide Fire is installed
• How to operate/shoot the Slide Fire
• How Slide Fire Compares to a full auto

Attendees: Please bring eye and ear protection
How the BallisticSearch™ Image Capture Solution Provides Real-time Investigative Information on Shooting Related Cases

**Instructor:** James Gannalo  
**Course Cost:** $35.00  
**Time:** 10:00 AM - 11:30 AM  
**Location:** Cheekwood B

In this presentation, retired NYPD Detective and independent Forensic Consultant, James Gannalo, will discuss his recent, independent evaluation of Vigilant Solutions' updated version of BallisticSearch - a portable hardware and software ballistics image capture and analysis solution. While tremendously valuable, ballistics imaging technology has historically been cost-prohibitive, or analysis may be delayed/simply unavailable for many agencies. BallisticSearch is designed to make ballistics image capture and analysis accessible to all agencies, enabling investigators to quickly capture images in the field of fired cartridge casings and upload these for correlation to a database of collected images in order to create real-time, investigative leads in shooting incidents. Detective Gannalo will discuss the results of the independent testing and evaluation he conducted on BallisticSearch to determine its ease of use, software interface and image quality.

Class Characteristics of Toolmarks in Bone and Cartilage

**Instructor:** Brian Smelser  
**Course Cost:** $65.00  
**Time:** 1:00 PM - 5:00 PM  
**Location:** Cheekwood A

Dismemberment and other toolmark cases related to bodies occur regularly and sometimes we are asked about the types of saws, if they were hand or power tools, and other questions. Often, we haven't taken the time to make cuts in bone to see what those class characteristics are. During this workshop, we will look at class characteristics of saws (and other tools), their marks in bone, and knives in cartilage. We will look at casting and preserving the toolmarks, discussing issues related to different types of substrates of the toolmark, and prepare tests for comparison purposes.

Tennessee State Museum Tour

**Course Cost:** $100.00  
**Time:** 9:00 AM - 11:00 AM  
**Location:** Location and transportation information will be provided during Monday’s Technical Session announcements.

Workshop on antique firearms, including operation and care; discussion of ammunition; display of antique firearms that can be handled by tour members; gunsmith exhibition with tools of the trade.

Lunch on your own: Farmer's Market Food Court recommended

Tennessee State Museum (1:00 - 4:00 pm):

Introduction to the building and galleries; self-guided tours through the exhibits. Permanent exhibitions include Forging a Nation, 1760 to 1860 and Civil War and Reconstruction (1860-1870). Current temporary exhibitions highlight Tennessee's musical heritage, World War I, and art collections pre- and post-1900.
Evofinder Sample Imaging – Bullets, Cartridges, and Toolmarks

Instructors: Neal Schrode and Kevin Boulay
Course Cost: $35.00
Time: 8:00 AM - 10:00 AM
Location: Cheekwood F

This workshop will use the Evofinder system to scan and image bullets, cartridges, and assorted toolmark samples for imaging, virtual comparison microscopy, and sample comparison using 3D imaging. Bring your unusual, deformed, impossible, or just strange samples to use for sample imaging. (Samples must be less than 1.0 x 1.0 x 3.0 inches with a region of interest for scanning that is less than a 1.0 x 1.0 in area.)

Glock Armorer’s Course

Instructor: Glock Professional, Inc.
Course Cost: $175.00
Time: 8:00 AM - 5:00 PM
Location: Magnolia Boardroom B

This one day course (8 hours) will cover the maintenance and service of the Gen5 pistol and previous Generations. Upon successful completion and payment of the course, each student will receive a 3 year Certified Armorer Certification
Attendees: Please bring eye protection
Thursday May 30th, 2019

**Barrett Manufacturing Tour**

Course Cost: $100.00  
Time: 7:00 AM - 12:00 PM  
Location: Location and transportation information will be provided during Monday’s Technical Session announcements.

Headquartered in Murfreesboro, Tennessee, Barrett is the world leader in large-caliber rifle design and manufacturing. Their products are used by civilian sport shooters, law enforcement agencies, the United States military and more than 73 State Department approved countries across the world.

**Documentation Workshop**

**Instructor:** Brian Smelser  
Course Cost: $35  
Time: 8:00 A.M. – Noon  
Location: Cheekwood C

Documentation of our observations is the foundation of our case files. Looking back, you can see that there is always an evolution related to the documentation in case files over the years. The ideas about documentation are as diverse as the number of examiners in AFTE. However, there are some basic principles and questions that we should consider. The answers to these questions along with other past experiences, shape the amount, style, types, and volume of documentation that is exhibited in our case files. We will explore, discuss, and practice some of these issues. You will have the tools to discuss the ideas that will shape the documentation in your system and your case files in the future. Please bring computers and basic cameras (if you can easily do so) for practice some different documentation ideas and forms. Also, be prepared, if you can, to share the types of forms and worksheets that your laboratory uses for the healthy exchange of these strategies.

**How to Identify “Other Firearms”**

**Instructor:** Daniel O’Kelly  
Course Cost: $40.00  
Time: 8:00 AM - 10:00 AM  
Location: Cheekwood B

The wave of new firearm models in recent years has law enforcement confused about what seem to be legal short-barreled rifles and shotguns. They fall into a classification called “Other Firearms”. Already this year, there is another ATF ruling which has changed everything and turned the federal regulation of short-barreled shotguns and rifles on its head. Learn why, when and how one gun is a federal felony to possess without registration and another just like it can be legally purchased from any gun store, or made at home.

**Matchpoint Tips and Tricks**

**Instructor:** Andrew Boyle  
Course Cost: $35.00  
Time: 9:00 AM - 12:00 PM  
Location: Cheekwood A

The following workshop will go over the vast variety of tools and options available within your Matchpoint HD3D workstation with a special emphasis on real-world workflows for screening cartridge case and bullet images effectively.
**Barrel Making**

Instructor: Allan Offringa  
Course Cost: $45.00  
Time: 12:00 PM - 4:00 PM  
Location: Cheekwood A

From raw material to finished barrel, what an examiner needs to know about the tools used and the marks they leave.

**Remington 870 Pump Shotgun Armorer’s Update Course**

Instructor: Joe Daniels  
Course Cost: $150.00  
Time: 8:00 AM - 5:00 PM  
Location: Magnolia Boardroom B

The Police Pump Shotgun Armorer’s Update Course is an eight hour course that covers the nomenclature, operation and repair of the 870 Pump shotgun. Upon completion the student will be able to safely operate, disassemble, function check and perform armorer level maintenance on the shotgun. They will also be able to inspect the firearm to ensure that it can be safely operated. This course has specifically modified for the forensic firearms examiner.

Attendees: Please bring eye protection
Friday May 31st, 2019

**Double Casting: Best Practices**
Instructor: Paul J. Murphy
Course Cost: $45.00
Time: 8:00 AM - 10:00 AM
Location: Cheekwood C

Forensic Double Casting is a technique used to make microscopic quality accurate replicas of fired bullets and cartridge cases (evidence and/or test fires). The technique is becoming an increasingly common way of exchanging ballistic information across interstate/interprovince and international borders leaving the integrity and chain of custody of the originals intact. The technique also has an application in certain tool mark cases. This 2 hour workshop demonstrates the equipment and techniques required and their results.

**Serial Number Restoration**
Instructor: Jennifer Owens
Course Cost: $55.00
Time: 8:00 AM - 12:00 PM
Location: Cheekwood B

Serial Number Restoration / Magnetic Particle Inspection and Bar Code Deciphering

The Bureau of Alcohol, Tobacco, Firearms and Explosives will present a 4 hour workshop on the restoration of obliterated serial numbers using the method of magnetic particle inspection (Magnaflux). The workshop will include lecture, demonstration and hands-on practicals.

This workshop will also review the manual decryption process of partially obliterated bar codes and provide the method of interpreting the bar code characters.

Registrants are required to bring lab coat and protective eye wear to the class

**Ammunition and the Firearms Examiner**
Instructor: George Kass
Course Cost: $35.00
Time: 8:00 AM - 12:00 PM
Location: Cheekwood A

A comprehensive discussion about cartridge/component development from muzzleloaders through modern day. Also included is a section regarding descriptive terms and techniques applicable to the examiner’s report writing. Finally, an interesting discussion about unusual ammunition components.
A common task for the firearm examiner is to identify the origin of a cartridge by the head stamp. A head stamp can be more than just the usual letters and numbers. It can contain abbreviations in foreign languages and Arabic numbers as well as symbols. But beyond this, the arrangement of the information on the head stamp might be of importance. Special or meaningful codes such as dates, OEM manufacturers, and other may also be hidden on the headstamp amongst the more obvious information.

There are many caliber designations, and the difference in measurements can differ only by fractions of an inch. The determination of the correct caliber is, in many cases, easy by reading the headstamp. However, in some cases, even with readable information on the case head, it can be a difficult task. Demonstration will show how CartWinPro is applied in these cases.

Color Codes will be discussed as an important means to describe the nature of the cartridge and they may also be of importance in determining if the cartridge should not be fired in a particular type of range. Coding is usually standardized within a country or an organization, but may have a completely different meaning if it is from another source. Color codes are not only encountered on the bullet-itself, but also in other locations such as the primer annulus, head stamp, or case mouth. Combinations of these codes may also be used to designate the type of cartridge.

**Springfield XD/XDm Armorer’s Course**

**Instructor:** Gary Monreal  
**Course Cost:** $185.00  
**Time:** 8:00 AM - 5:00 PM  
**Location:** Magnolia Boardroom B

These courses provide complete and detailed answers to specific questions concerning the weapons mechanical functioning, operational procedure, field stripping and armorer detailed stripping, inspection(s), troubleshooting, and corrective actions/maintenance.

**Outcomes:**  
• Conduct proper disassembly and reassembly of the firearms and their sub-assemblies.  
• Conduct preventative maintenance and inspection procedures applicable to each firearm type.  
• Diagnose reported field problems relating to each firearm type.

Service and repair each firearm type to include the installation of new components.

**Attendees:** Please bring eye protection
### Machine Guns and Clandestine Conversions

**Instructor:** Daniel O’Kelley  
**Course Cost:** $125.00  
**Time:** 8:00 AM - 5:00 PM  
**Location:** Location and transportation information will be provided during Monday’s Technical Session announcements.

Learn the ten most common home-made machineguns and clandestine conversions of semiauto firearms to machineguns. What to look for in determining whether the firearm in question has been converted, as well as field-testing semiautomatics for full-auto capability without having to fire them. Also covered are bump-firing, Gatling guns, deactivated war trophies, re-welds, fire-on-release type triggers, and methods of machinegun destruction which are acceptable to ATF.

**Attendees:** Please bring eye and ear protection

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### Bullet Deflection as a Result of Perforation

**Instructors:** Michael Haag and Lucien Haag  
**Course Cost:** $125.00  
**Time:** 8:00 AM - 3:00 PM  
**Location:** Location and transportation information will be provided during Monday’s Technical Session announcements.

This workshop is a live fire investigation of the deflection caused by perforation of various materials.

A variety of firearms (handguns and long guns) and ammunition (expanding and non-expanding) will be employed. Firearms will be secured and fired without intervening impact materials in order to establish reproducibility. A variety of intervening materials will then be placed in the bullet paths, and deflection will be measured. Measurements may be derived via trigonometry and 3D laser scanning.

Materials to be perforated ay include, but may not be limited to: glass, drywall, tissue stimulant, wood, sheet metal. Student requests for materials may be accepted prior to the conference.

**Students will participate in the experimentation and measurements.**

**Students must provide ear and eye protection and note taking materials.**
5.11 Night

Friday, May 31st, 5:00-8:00pm

Join us for food, drinks and raffle prizes, sponsored by 5.11, and enjoy a VIP discount in their 5.11 Tactical Store in Green Hills. Transportation to and from the event is included.

Location: 5.11 Tactical Store, 2101 Abbott Martin Rd, Nashville
AFTE 2019 RAFFLE DONORS

The AFTE 2019 Host Committee would like to extend our deepest gratitude to the following companies and individuals for their generous donations to the 2019 raffle:

Elsevier Publishing
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Pepperball
Nashville Sounds
FAAM/FTW
Cybernational
Glock/Glock Store
Jackalope Brewery
Fat Bottom Brewery

And More

Raffle prizes will be on display at the raffle tables located inside the Tennessee Ballroom
“There are many examples of traditions that build camaraderie in the military, but few are as well-respected as the practice of carrying a challenge coin—a small medallion or token that signifies a person is a member of an organization. Even though challenge coins have broken into the civilian population, they’re still a bit of a mystery for those outside the armed forces.

**Challenge Coin Origins**
It’s nearly impossible to definitively know why and where the tradition of challenge coins began. One thing is certain: Coins and military service go back a lot farther than our modern age.
One of the earliest known examples of an enlisted soldier being monetarily rewarded for valor took place in Ancient Rome. If a soldier performed well in battle that day, he would receive his typical day’s pay, and a separate coin as a bonus. Some accounts say that the coin was specially minted with a mark of the legion from which it came, prompting some men to hold on to their coins as a memento, rather than spend them on women and wine.

**The First Official Challenge Coin...Maybe....**
Although no one is certain how challenge coins came to be, one story dates back to World War I, when a wealthy officer had bronze medallions struck with the flying squadron’s insignia to give to his men. Shortly after, one of the young flying aces was shot down over Germany and captured. The Germans took everything on his person except the small leather pouch he wore around his neck that happened to contain his medallion. The pilot escaped and made his way to France. But the French believed he was a spy, and sentenced him to execution. In an effort to prove his identity, the pilot presented the medallion. A French soldier happened to recognize the insignia and the execution was delayed. The French confirmed his identity and sent him back to his unit.

One of the earliest challenge coins was minted by Colonel “Buffalo Bill” Quinn, 17th Infantry Regiment, who had them made for his men during the Korean War. The coin features a buffalo on one side as a nod to its creator, and the Regiment’s insignia on the other side. A hole was drilled in the top so the men could wear it around their necks, instead of in a leather pouch.

**The Challenge**
Stories say that the challenge began in Germany after World War II. Americans stationed there took up the local tradition of conducting “pfennig checks.” The pfennig was the lowest denomination of coin in Germany, and if you didn’t have one when a check was called, you were stuck buying the beers. This evolved from a pfenning to a unit’s medallion, and members would “challenge” each other by slamming a medallion down on the bar. If any member present didn’t have his medallion, he had to buy a drink for the challenger and for anyone else that had their coin. If all the other members had their medallions, the challenger had to buy everyone drinks.”

**AFTE 2019 Challenge Coins**
In keeping with our tradition, in your welcome bags, you will find the AFTE 2019 Challenge coin. We encourage you to carry these with you at all times – keep it in your pocket, in your wallet, in your badge holder, in your shoe, or however you see fit. These coins represent not just a part of history, but also show that you are a part of this meeting and organization. Be warned, however, if a challenge is initiated you must produce your AFTE 2019 Challenge coin. If you are challenged and are unable to respond, you must buy a round of drinks for the group. If everyone responds, then the challenger must buy a round of drinks for the group.
The 2019 Host Committee wants to thank Hi-Point for its continued support of AFTE. Mike Strassell, President of Hi-Point Firearms, is continuing to honor Tom Deeb’s generosity through first time attendee sponsorship, making us the wonderful court exhibits we all use, providing workshops, and through donations. Thank you for all you do for us, we could not have a successful conference without your help!

Sincerely,

The AFTE Host Committee and Community

We hope you enjoyed your time with us! See you in Austin!
Join us for a one of a kind AFTE Banquet aboard the fabulous General Jackson Showboat
Thursday, May 30, 6:00 PM -11:00 PM

Busses will transport all attendees from the Gaylord Opryland Hotel between 5:50PM-6:30 PM

Boarding will take place between 6:00 PM-6:30 PM and we will depart the dock at 6:30 PM

Once aboard the General Jackson Showboat we will enjoy a reception on the outer decks

Banquet Agenda
Dinner/ Victorian Theater  7:00 PM-8:30 PM
Downtown Nashville Viewing  8:20 PM-8:45 PM
AFTE Banquet Awards Presentation  8:45 PM -9:30 PM
Entertainment/Dancing  9:30 PM – 11:00 PM

We will return dock at 10:00 PM where entertainment and dancing will continue until 11:00 PM

Please note: The US Coast Guard mandates that all passengers be subject to a bag check prior to boarding the vessel.
AFTE 2020
Austin, TX
51st Annual Training Seminar
May 24-29, 2020

Renaissance Austin Hotel
9721 Arboretum Boulevard, Austin, TX 78759  (512) 343-2626
www.marriott.com/hotels/travel/auskh-renaisance-austin-hotel

Ground Transportation: The Renaissance Austin Hotel is located ~16 miles from the Austin-Bergstrom International Airport. Fear not! SuperShuttle, Uber, Lyft, and taxis are available. SuperShuttle costs ~$25 each way for a round trip reservation.

Hotel Room Rate: You'll get Uncle Sam's rate (currently $145/night) + taxes (currently 15%)

Guest Parking:
- Do-it-Yourself: Daily complimentary, $5 overnight
- White Glove Service: $1.8 daily, $25 overnight

Amenities: Each room includes a magic picture box, electronic wake-up device, wrinkle-releaser, cold storage, caffeine dispenser, and free internet (which is pretty fly for a Wi-Fi). It's hot here in Texas; choose from two pools to help you cool down! Did we mention that the Renaissance Austin Hotel is also pet friendly?

Nearby: The Renaissance Austin Hotel is located in North Austin near the Arboretum. Delicious chef-crafted food (try the shishito peppers!) and unique cocktails can be found inside the hotel at the Knotty Deck & Bar. Additional restaurants and shops are located within walking distance. The Domain (Austin's premier dining, shopping, and entertainment district) is only a short shuttle ride away! Looking for more to do? Head downtown to take a tour of the Texas State Capitol, groove to live music, and catch a glimpse of the Congress Avenue bats.

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