



Challenging Firearms Pattern Matching Testimony:

Back to BA*l*iStICS

Presented By:
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Trial Skills - 2019

How does a gun work?

PUTTING A ROUND IN THE CHAMBER

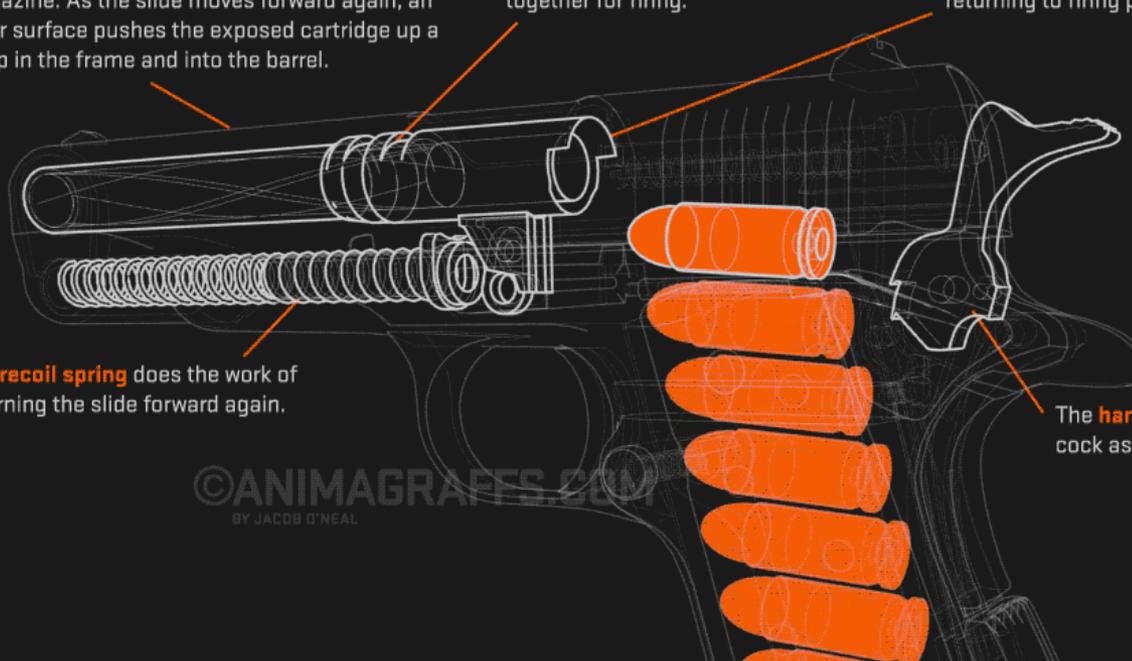
The **slide** is moved to its furthest rearward travel, which allows the top of a cartridge to exit the magazine. As the slide moves forward again, an inner surface pushes the exposed cartridge up a ramp in the frame and into the barrel.

Grooves called **locking lugs** secure the barrel and the slide tightly together for firing.

The **barrel** moves with the slide, tilting back and down to accept a round, and straight again when returning to firing position.

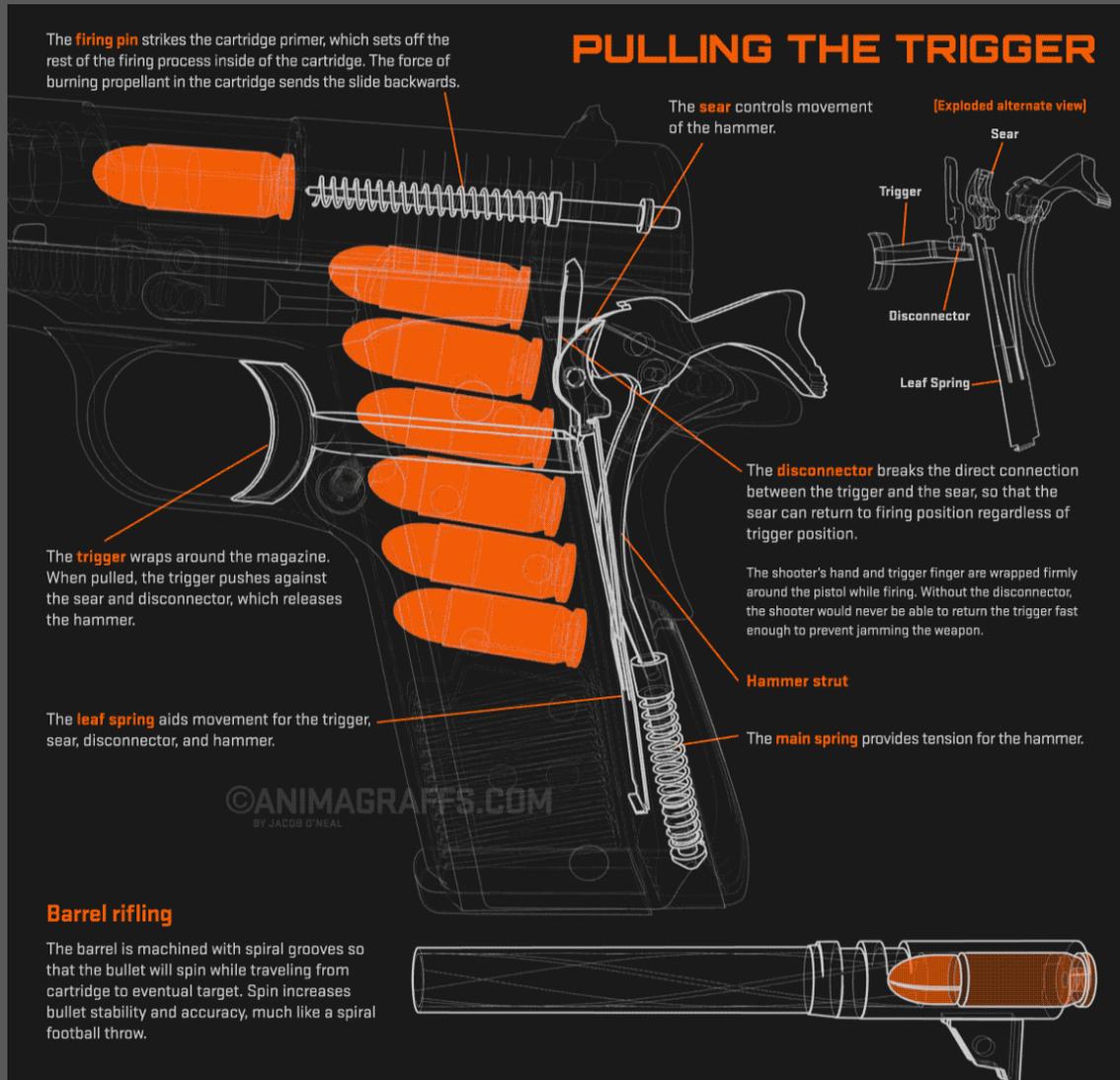
The **recoil spring** does the work of returning the slide forward again.

The **hammer** is pushed back into full cock as the slide moves backward.



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How does a gun work?



How does a gun work?

CARTRIDGE EJECTION

Extractor

The extractor has a notch into which a cartridge rim fits snugly. It pulls the spent cartridge backward with the slide.

Ejector

The ejector is attached to the gun frame, and has a small ramp at the front that pushes a spent cartridge upward.

Together, the extractor and the ejector send the used cartridge upward and outward, clearing the chamber.

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How does a gun work?

AMMUNITION

[TOP VIEW]

Cartridge

Bullet cartridges are generally made of brass. Brass is resistant to corrosion, can withstand the high pressures necessary for firing, and can also be reformed and reloaded many times.

Bullet

The term "bullet" is often used to refer to entire cartridge and its contents. However, a bullet is more precisely defined as the projectile component of ammunition.

Bullets are designed to seal in propellant gas and also engage the rifling without becoming deformed, or damaging the bore (the inside of the barrel).

Lead

Lead is the most common handgun bullet material. Lead is popular for its density and mass, cost, and low melting point which makes bullet fabrication easier.

Grain

Grain is the projectile (bullet) weight measurement. This does not include the entire cartridge.



Full Metal Jacket

Full Metal Jacket means the soft lead projectile is encased in a hard metal exterior. Jacketed bullets have greater penetration through hard objects.

However, a full jacket bullet may pass clean through softer materials without causing sufficient damage.

Hollow Point

Hollow point bullets have a cavity at the tip. The lead in a hollow point bullet expands upon impact, creating a desirable mushroom effect which minimizes the risk of over-penetration and leaves a wider wound cavity.



[Expended hollow point bullet exhibiting mushroom formation]

Caliber

Caliber is the projectile (bullet) diameter in inches. "Forty-five" means .45 inch caliber or diameter.



Propellant

Gases from burning propellant push the bullet down the bore and eventually out of the barrel.

Smokeless powder

The propellant is generally a smokeless powder. Smokeless powder is designed to produce a negligible amount of smoke when fired unlike its predecessor, black powder.

Primer

The primer is a metal cup containing primary explosive, which is inserted into the base of the cartridge. **Primary explosive** material is sensitive to impact.

The firing pin crushes the primary explosive to produce hot gas and a shower of sparks which ignite the powder charge.

MAGAZINE

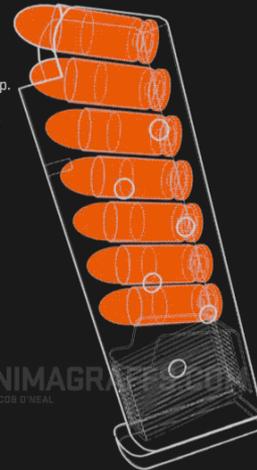
The magazine is designed so that cartridges exit forward and upward instead of straight out the top.

Magazines for a 1911 model handgun are typically loaded by hand, one round at a time.

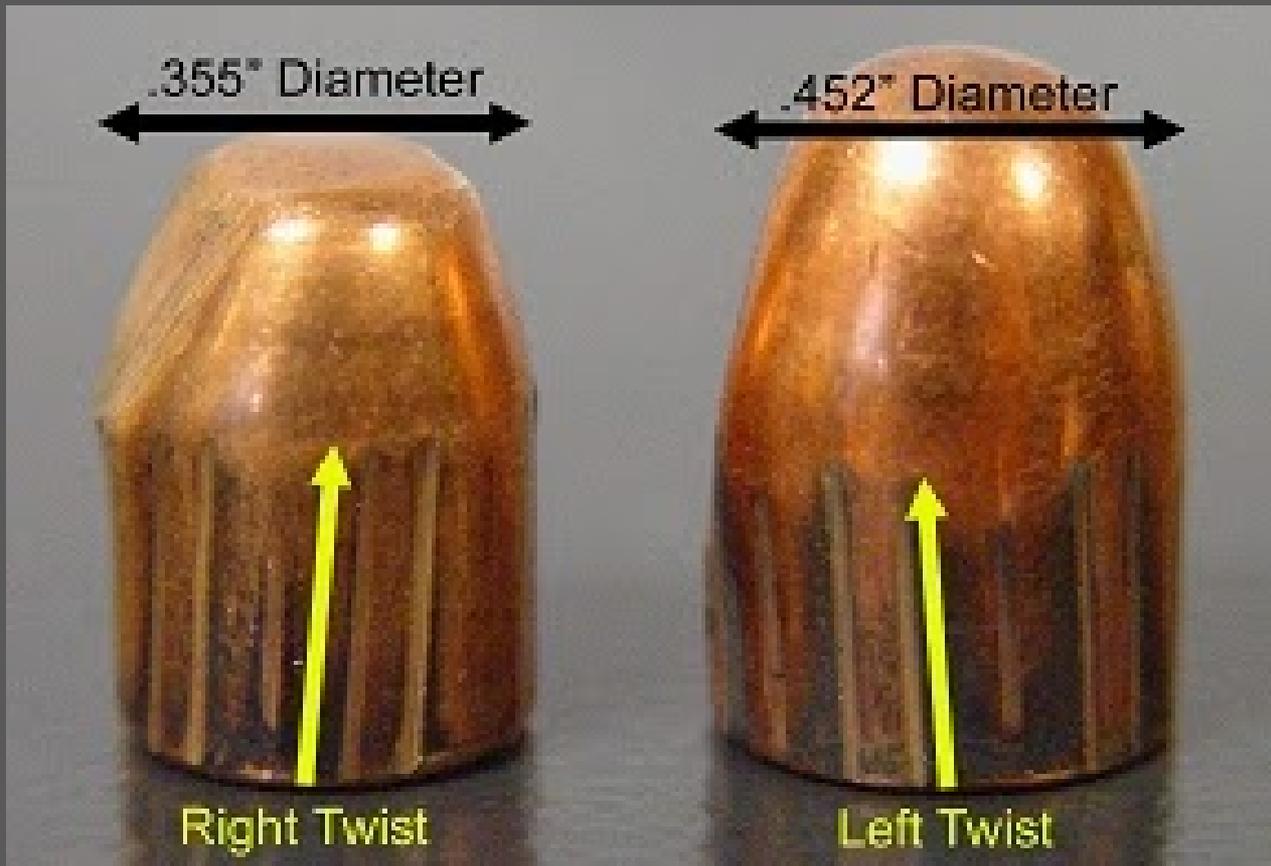
Magazine or Clip?

A clip can be used to help insert cartridges into a magazine, however, a **magazine is never called a clip**.

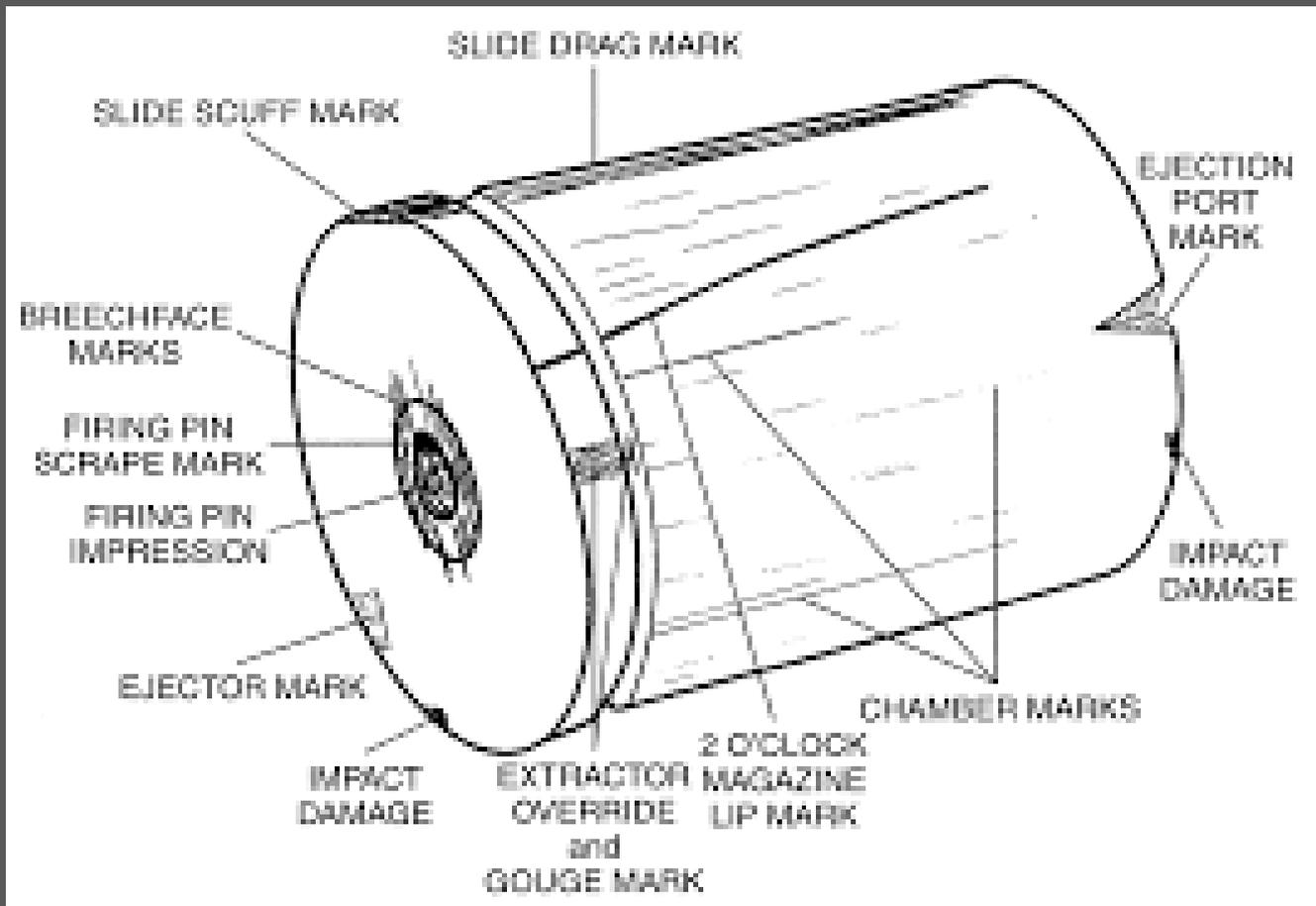
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Patterns of Interest



Patterns of Interest



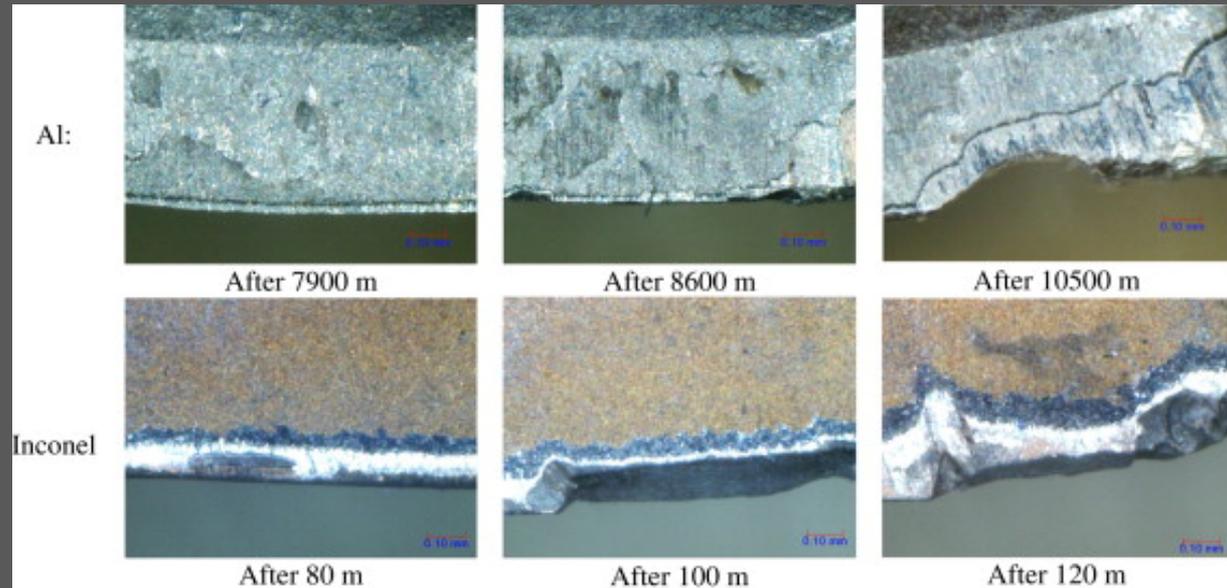
Patterns of Interest



Why Do Patterns Matter?

- Theory:

- Tools used in manufacturing wear over time



- Thus each individually manufactured gun has unique microscopic patterns

No Scientific Basis!

Summary Assessment

The scientific basis for the evaluation of impression evidence is that mass-produced items (e.g., shoes, tires) pick up features of wear that, over time, individualize them. However, because these features continue to change as they are worn, elapsed time after a crime can undercut the forensic scientist's certainty. At the least, class characteristics can be identified, and with sufficiently distinctive patterns of wear, one might hope for specific individualization. However, there is no consensus regarding the number of individual characteristics needed to make a positive identification, and the committee is not aware of any data about the variability of class or individual characteristics or about the validity or reliability of the method. Without such population studies, it is impossible to assess the number of characteristics that must match in order to have any particular degree of confidence about the source of the impression.

How is firearm evidence used?



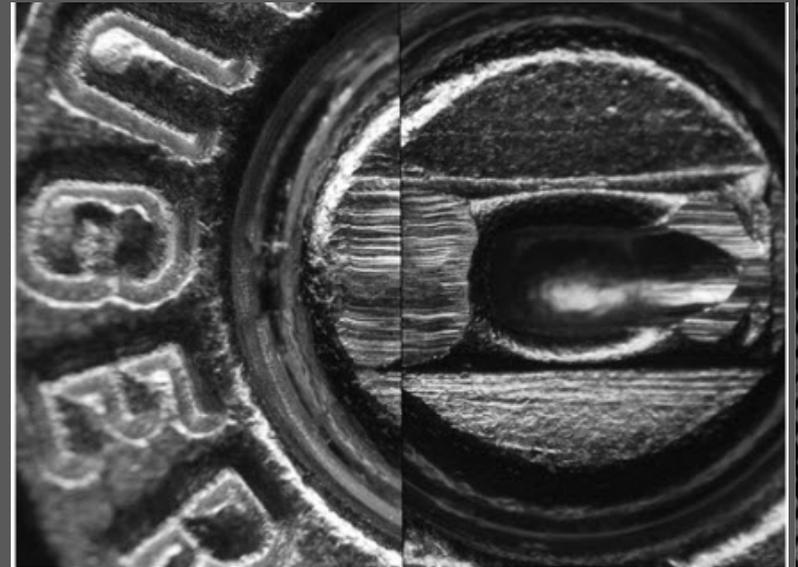
Gun Recovered

- Test fires
- Matching to scene

No Gun

- Connecting multiple shootings

How are comparisons made?



How are comparisons made?

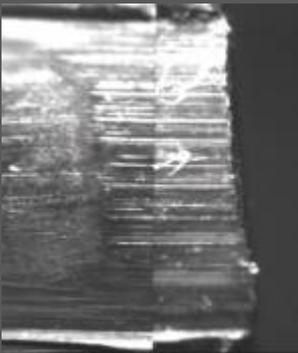
- **Class Characteristics**

- Caliber (i.e. 9mm, 0.45)
- Number of lands/grooves in barrel
- Direction of twist in barrel
- Ammunition manufacturer



- **Subclass Characteristics**

- Characteristics that could appear in consecutively manufactured guns



- **Individual Characteristics**

- Microscopic differences (i.e. striations)

When is it a match?

AFTE defines significant agreement:

“when it exceeds the best agreement demonstrated between tool marks known to have been produced by different tools and is consistent with the agreement demonstrated by tool marks known to have been produced by the same tool.”

SUBJECTIVE!

My Case Has Firearms Evidence, Now What?

- Keep It Out
 - *Daubert*
 - Relevance
- Limit the Conclusions
 - Scope of testimony
 - Language used
- Discredit/Debunk



Daubert (Frye) Challenge

U.S. v. Green, 405 F. Supp2d 104 (D. Mass 2005)

Limited testimony to preclude “definitive match”

“The only weapon he was shown was the suspect one; the only inquiry was whether the shell casings found earlier matched it. It was, in effect, an evidentiary “show-up,” not what scientists would regard as a ‘blind’ test.”

“The more courts admit this type of toolmark evidence without requiring documentation, proficiency testing, or evidence of reliability, the more sloppy practices will endure; we should require more.”

Cases Continued

U.S. v. Williams, 306 F.3d 151 (2nd Cir. 2007)

- Expert testimony admitted but Court cautioned:

“We do not wish this opinion to be taken as saying any proffered ballistics expert should be routinely admitted.”

U.S. v. Glynn, 578 F.Supp2d 567 (S.D.Ny 2008)

- Expert limited to saying bullet was “more likely than not” a match

U.S. v. Willock, 696 F.Supp2d 536 (D.Md 2010)

- Expert could not express degree of certainty

Reports

Strengthening Forensic Science in the United States: A Path Forward
<http://www.nap.edu/catalog/12589.html>

STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES

A PATH FORWARD

Committee on Identifying the Needs of the Forensic Science Community

Committee on Science, Technology, and Law
Policy and Global Affairs

Committee on Applied and Theoretical Statistics
Division on Engineering and Physical Sciences

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REPORT TO THE PRESIDENT Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods

Executive Office of the President
President's Council of Advisors on
Science and Technology

September 2016



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Reports

Audit of the Detroit Police Department
Forensic Services Laboratory Firearms Unit

October 28, 2008



Michigan State Police
Forensic Science Division

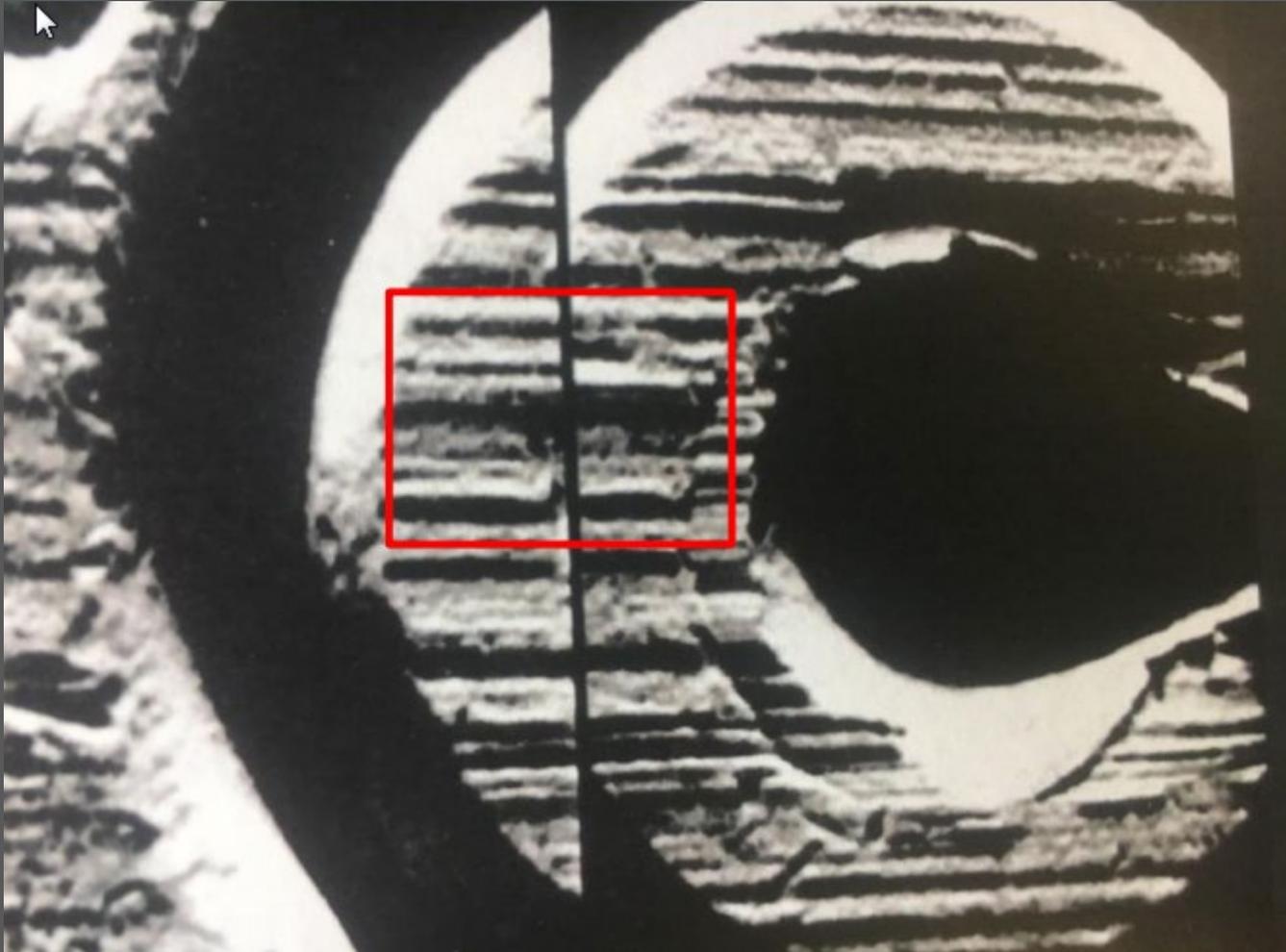
- Detroit Firearms Unit closed after 2008 Audit
- 10% error rate!

In total, approximately 10% of the firearms cases reanalyzed had significant errors. On average, the DPD firearms unit completes approximately 1,800 cases per year. If this 10% error rate holds, the negative impact on the criminal justice system may be substantial.

Discredit

- BIAS
- QUALIFICATIONS
- EXPERIENCE
- STANDARDS

Discredit



Theory of the case?

Expert?

Questions?

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