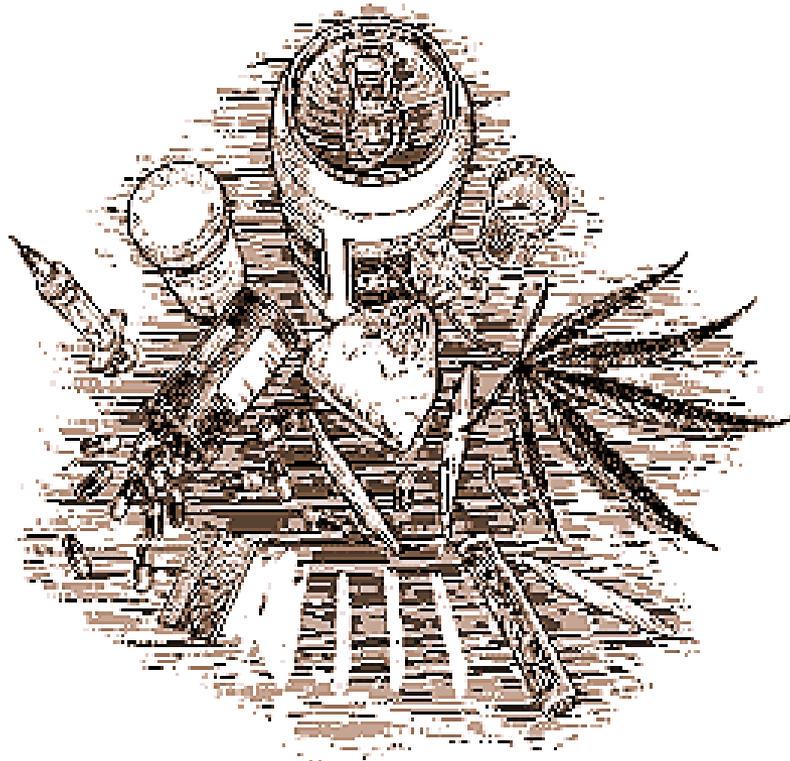


Physical Evidence

Chapter 3



Physical Evidence

- Blood, Semen, Saliva
- Documents
- Drugs
- Explosives
- Fibers
- Fingerprints
- Firearms and Ammunition
- Glass
- Hair
- Impressions

Physical Evidence

- Organs and Physiological Fluids
- Paint
- Serial Numbers
- Tool Marks
- Other

Significance of Physical Evidence

- **Identification** - Determination of physical or chemical identity of a substance with as near certainty as the analytical method will permit.
 - ex. drug analysis, species determination, explosive residue
- **Comparison** - Compares standard and suspect samples to determine if they have a common origin.
 - Can the source of the sample be identified?
 - How many “data points” are necessary to be “certain beyond a reasonable doubt” of the answer (probability)?

Physical Evidence Characteristics

- **Class (Group) Characteristics** - Properties of evidence that can only be associated with a general group and not with a common source.
- **Individual Characteristics** - Properties of evidence that can connect a sample and standard to a common source (with high probability).

Class (Group) Characteristics –

- e.g., blood type, single-layer paint chip, nylon fiber from a sweater, paint or dye lot, etc.
- Can be used to rule out a suspect.



Blood Types *World:*

Type A - 42%

Type B - 8%

Type O - 47%

Type AB - 3%

US:

Type A - 39%

Type B - 13%

Type O - 43%

Type AB - 5%

Class (Group) Characteristics –

Example: from “My Cousin Vinny” (20th Century Fox)

- 2 people charged with murder during a robbery at a convenience store (“Sack-O-Suds”)
- Escaped in an older car and skidded tires while leaving.
- Witnesses confused but say they saw the two defendants.
- Expert from FBI called to match tire skids with defendants car.

Advantages of Class Physical Evidence

- Provides corroboration of events based on objective scientific data
- Multiple types of class evidence may lead to an extremely high chance that they originated from the same source.
- Physical evidence has great weight in the courtroom.
- Class evidence may also serve to exonerate a person.

Advantages of Class Physical Evidence

Multiple types of class evidence may lead to an extremely high chance that they originated from the same source.

Type AB blood - 3%

Rh Negative - 16%

Left-handed - 13%

Male - 50%

Probability for random match =

$$0.03 \times 0.16 \times 0.13 \times 0.50 =$$

$$0.00031 \text{ or ca. 3 in 10,000}$$

Blood Types

World:

Type A - 42%

Type B - 8%

Type O - 47%

Type AB - 3%

US:

Type A - 39%

Type B - 13%

Type O - 43%

Type AB - 5%

Product Rule: multiplying frequencies of genetic markers to obtain a overall frequency of occurrence for a profile

Advantages of Class Physical Evidence

Multiple types of class evidence may lead to an extremely high chance that they originated from the same source.

Type AB blood = 3% And Red Haired = 3%

Rh Negative = 16% And Over 6'2" = 5%

Left-handed = 13%

Male = 50%

Probability for random match =

$$0.03 \times 0.16 \times 0.13 \times 0.50 \times 0.03 \times 0.05 =$$

0.00000047 or ca. 5 in 10 million

Limitations of Class Physical Evidence

The value of class physical evidence is based on its ability to provide support of events with data that are, as much as possible, free of human error and bias.

Crossing over the line from class to individual is a difficult question to answer.

- How many “matches” are necessary?
 - How many striations are necessary to individualize a mark to a single tool and no other?
 - How many color layers individualize a paint chip to a single car?
 - How many ridge characteristics individualize a fingerprint?
 - How many handwriting characteristics tie a person to a signature?

Individual Characteristics –

- e.g., fingerprints, unusual wear patterns, tool marks, bullets, shattered windows, etc.

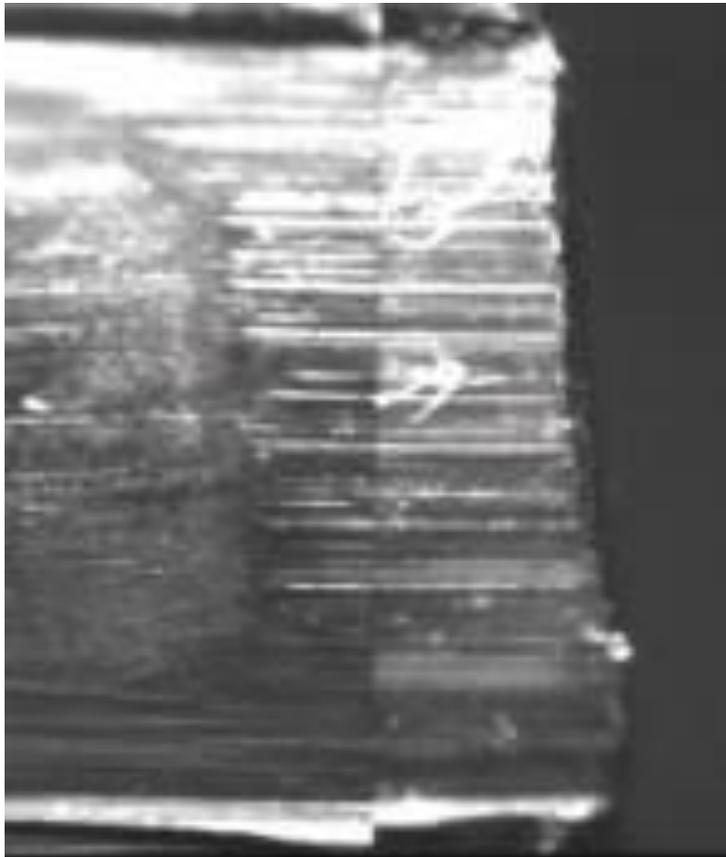


Body of a woman was found with a knife wound in her neck. A broken knife tip was found in the wound. The knife blade tip was compared with the knife found in the husbands pocket. Matches both in brake line and scratches.

Saferstein Fig. 3.1

Individual Characteristics

Firearms ID

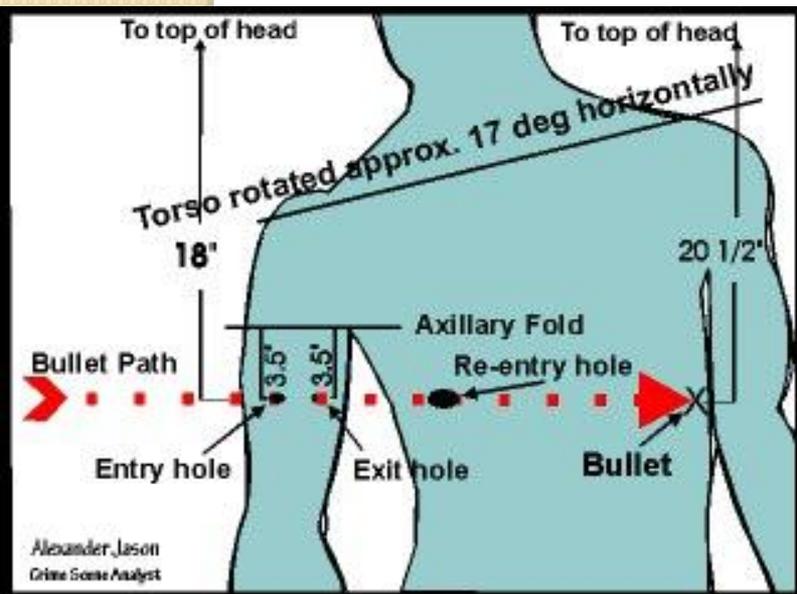


Forensic Databases

- *The Integrated Automated Fingerprint Identification System (IAFIS)*, a national fingerprint and criminal history system maintained by the FBI.
- *The Combined DNA Index System (CODIS)* enables federal, state, and local crime laboratories to electronically exchange and compare DNA profiles.
- *The National Integrated Ballistics Information Network (NIBIN)* allows firearm analysts to acquire, digitize, and compare markings made by a firearm on bullets and cartridge casings.
- *The International Forensic Automotive Paint Data Query (PDQ)* database contains chemical and color information pertaining to original automotive paints.
- *Shoeprint image capture and retrieval (SICAR)* is a shoeprint database.

Crime-Scene Reconstruction

- Collaborative effort of law enforcement personnel, medical examiners and criminalists
 - Was there more than one person involved?
 - How was the crime committed?
- Reconstruction supports likely sequence of events by the observation and evaluation of physical evidence and statements made by witnesses and those involved with the incident
- Reconstructions can play a vital role in aiding the jury to arrive at an appropriate verdict.



Crime-Scene Reconstruction

Step 1 - State problem - type of crime and the legal elements.

Step 2 - Collect data - - records checks and police checks, interview victim, witnesses, and suspects, try to get additional witnesses and comparison samples from suspects

Step 3 - Form a hypothesis - look at all evidence - determine motive and possible suspects

Step 4 - Test hypotheses - evaluate how truthful and reliable the stories are, weigh their stories against the physical evidence

Step 5 - Follow up the most promising hypotheses (theories)

Step 6 -- Draw conclusions - supported by court-admissible evidence leading to the arrest, prosecution, and conviction of the offender.

Patterns -- series of similarities that indicate the same person or the same modus operandi is involved in different crimes

Leads -- clues or breaks in the case that move an investigation forward

Tips -- provided by informants. Tips by definition involve specifics

Theories -- beliefs that point in one direction

Clues -- pieces of evidence that are consistent with the elements of the crime.

Physical Evidence

LEVELS OF CERTAINTY AND LEVELS OF PROOF						
PROOF	Intuition	Probable Cause	Preponderance of Evidence	Clear and Convincing	Beyond Reasonable Doubt	Scientific Certainty
EVIDENCE	hunch, guess, or gut feeling	facts a reasonable person would accept	Corroborated facts, eyewitness testimony, physical evidence, or evidence interpreted by an expert			Precise facts with known accuracy
QUANTITY	articulable suspicion about possible facts	prima facie, presumptive but rebuttable facts	Over 50% of facts are in support	Slightly less facts than beyond reasonable doubt	Sufficient facts to preclude every reasonable alternative hypothesis	Overwhelming facts
CERTAINTY	apparent	possible	Basis for hypothesis formulation		Basis for theory construction	Seldom achieved
LAW	suppressed	basis for binding over to next stage	Civil law standard of proof	International law standard of proof	Criminal law standard of proof	Seldom used
INVESTIGATION	useful during early stages	basis for arrest or search warrant	basis for confession and informant law		basis for conviction	Seldom used

Crime-Scene Reconstruction

