

# Physical Evidence

## Physical Aspects of Forensic Science



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## Learning Objectives

- ✦ List the common types of physical evidence encountered at crime scenes.
- ✦ Explain the difference between the identification and comparison of physical evidence.
- ✦ Define individual and class characteristics and give examples of physical evidence having these characteristics.
- ✦ Explain the purpose physical evidence plays in reconstructing the events surrounding the commission of a crime.

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## Definitions

### ✦ Evidence:

- ✦ The means employed for the purpose of proving an unknown or disputed fact
- ✦ The means by which an alleged matter of fact (the truth of which is submitted to investigation at a trial) is established or disproved.
- ✦ Any information upon which a person can make a decision.

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## Definitions (Continued)

### Legal Evidence:

- Any species of proof or probative matter, legally presented at the trial of an issue, by act of the parties, and through the
  - Testimony of witnesses
  - Introduction of records
  - Introduction of documents
  - Introduction of exhibits or objects
  - Introduction of any other probative matter

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## Definitions (Continued)

### Legal Evidence (continued):

- Offered for the purpose of inducing belief in the minds of the court or jury as to their contention
- That demonstrates or makes clear or ascertains the truth of the very fact or point in issue, whether on the one side or the other

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## Definitions (Continued)

### Direct Evidence:

- That means of proof which tends to show the existence of a fact in question, without the intervention of the proof of any other fact.
- That immediately points to a question at issue (e.g., in a homicide case a witness testifies he saw the accused stab the victim.

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## Definitions (Continued)

### ⚡Circumstantial (indirect) Evidence:

- ⚡The truth is arrived at through inferences of probabilities arising from an association of facts.
- ⚡The existence of a principal fact is only inferred from the circumstances.

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## Definitions (Continued)

### ⚡Cumulative Evidence:

- ⚡Evidence that goes to prove what has already been established by other evidence.
- ⚡Evidence from a same or new witness that simply repeats, in substance and effect, or adds to what has already been established.

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## Definitions (Continued)

### ⚡Corroborative Evidence:

- ⚡Evidence that is supplementary to that has already been give, that tends to strengthen or confirms it.
- ⚡Additional evidence of a different character but points to the same point.

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## Definitions (Continued)

### Relevant Evidence:

- Evidence having any tendency to make the existence of any fact that is of consequence to the determination of the action more probable or less probable that it would be without the evidence.

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## Definitions (Continued)

### Material Evidence:

- Evidence that goes to the substantial matters in dispute or has a legitimate and effective influence or bearing on the decision of the case.

### Competent Evidence:

- Evidence that is admissible under established rule for proving a relevant fact.

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## Definitions (Continued)

### Hearsay Evidence:

- A statement, other than one made by the witness while testifying at the trial or hearing, offered to prove the truth of the matter asserted.
- Witness's statements based upon what someone else has told him and not upon personal observation or knowledge.

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## Rules of Evidence

↓ They exist to:

- ↓ protect the accused,
- ↓ assure that the evidence is credible, dependable and trustworthy before it is considered by the jury,
- ↓ keep untrustworthy or prejudicial evidence out of the trial.
- ↓ insure orderly and efficient proceedings

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## Reasons for Excluding Evidence

↓ Protection of interests and relationships:

- ↓ Husband/wife privilege
- ↓ Attorney/client privilege
- ↓ Doctor/patient privilege
- ↓ Penitent/confessor privilege

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## Reasons for Excluding Evidence (continued)

- ↓ Avoidance of undue prejudice to the accused
- ↓ Prohibition of consideration of unreliable evidence (e.g., hearsay and opinion evidence [although expert opinion is allowed])

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## Reasons for Excluding Evidence (continued)

- ⚡ Reduction of violations of constitutional safeguards (evidence obtained in violation of constitutional safeguards is usually excluded)
- ⚡ Avoidance of a waste of time
  - ⚡ Cumulative evidence that is unnecessary and repetitive can be considered inadmissible to save time.

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## Physical Evidence

- ⚡ Serves to associate the criminal/victim with the crime scene and each other.
- ⚡ Any material type of evidence can become physical evidence for a crime.

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## Physical Evidence

- ⚡ Types of physical evidence:
  - ⚡ Biological:
    - ⚡ Blood, semen, saliva, body fluids, plants, animals, wood, tissues, etc.
  - ⚡ Chemical:
    - ⚡ Fibers, chemicals, glass, soil, gun powder, minerals, drugs (legal and illicit), paper, materials (metals, polymers, paint), pharmacological, toxicological, etc.

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## Physical Evidence

### Types of physical evidence:

#### Physical:

Fingerprints, firearms, handwriting, indented writing, serial number restoration, footprints, tire marks, tool marks, typewriting, photocopiers, etc.

#### Miscellaneous:

Laundry marks, voiceprint, polygraph, photography, etc.

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## Physical Evidence and the Forensic Lab

**Criminalistics: knowledge of the collection, identification, individualization and evaluation of physical evidence**

Generalist

ID of evidence

Individualization of evidence

Origin of evidence

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## Physical Evidence and the Forensic Lab

**Question Document Examiner: examination of handwriting, typewriting, printing, ink, paper and other aspects of a document**

Identify source or writer of document

Authenticate signature/forgery

Determine document age

Detect alterations

Examine writings, burned or charred documents

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## Physical Evidence and the Forensic Lab

- ✦ **Firearms examination:** examine firearms, bullets (discharged and unused) cartridge cases, shotgun shells, ammunition, etc.
  - ✦ What type of weapon fired the bullet?
  - ✦ Did this weapon fire this bullet?
  - ✦ What type of ammunition was used?
  - ✦ What was the distance from the weapon and the victim?

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## Physical Evidence and the Forensic Lab

- ✦ **Tool mark examination:** examination of tool mark impressions left at a crime scene, comparison of physical fractures found in evidence, restoration of stamped serial numbers on metals, etc.
  - ✦ Striations left by tools on surfaces can be linked to the tools

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## Physical Evidence and the Forensic Lab

- ✦ **Forensic Chemistry:** identification and analysis of drugs, toxins, arson accelerants, gunpowder residue, explosives and other chemicals.
  - ✦ Qualitative and quantitative analysis
  - ✦ Identification of unknown substances
  - ✦ Comparison to known standards
  - ✦ Identify substances to specific origins

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## Physical Evidence and the Forensic Lab

Trace Analysis: use of microscopy, instrumental and chemical analysis of hair, fibers, glass, soil, plant material, etc. to attempt to individualize evidence.

Trace evidence is microscopic evidence

Locard's Exchange Principle

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## Physical Evidence and the Forensic Lab

Fingerprints: process visible and latent fingerprints left at the crime scene and the evidence.

Chemical and physical methods for the detection and visualization of fingerprints

Comparison of fingerprints found with suspects' prints to determine a match

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## Physical Evidence and the Forensic Lab

Voice Analysis: Comparison of voice of suspect with tape recorded messages using a sound spectrograph (produces a visualization of sound patterns which are unique to a given individual).

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## Physical Evidence and the Forensic Lab

✚ Forensic Biology: Identification and individualization of blood and biological fluids using principles of biochemistry, serology, immunology, hematology and chemistry.

- ✚ What is the origin of the stain?
- ✚ What species?
- ✚ Does questioned stain have same DNA markers as known sample?

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## The Significance of Physical Evidence

✚ Identification:

- ✚ The process of placing an object in a predefined, restrictive class
- ✚ The determination of the physicochemical identity of a substance with as near absolute certainty as existing analytical techniques will permit
  - ✚ Adopt testing procedure that give reproducible results fo specific material
  - ✚ Exclusionary process
  - ✚ Different types of evidence require different identification procedures



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## The Significance of Physical Evidence

✚ Individualization: Is the crime scene evidence uniquely related to a suspect or an object in his possession?

- ✚ The evaluation of the combination of conditions that uniquely characterize an entity
- ✚ A relationship establishing an identity between two objects is determined
- ✚ The comparison between the crime scene evidence and control evidence from a suspect for the purpose of ascertaining their common origin



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## The Significance of Physical Evidence

### Individualization: (continued)

- Combinations of selected properties are chosen for comparison
- Comparisons must be made to allow for a conclusion either disproving the suspect evidence and control evidence derive from a common source or proving the suspect evidence and the control have a high degree of significant characteristics indicating that they have a common origin



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## The Significance of Physical Evidence

### Individualization: (continued)

- Associative evidence: a functional term to describe one of the crime labs' principal functions
  - Some connection or association has been established between the crime scene evidence and the suspect
  - A unique connection is established by examining the evidence and making an evaluation of the results.

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## The Significance of Physical Evidence

### Class and Individual Characteristics

- Class characteristics are the more obvious, general or gross features distinguishable in an object that are repeated in other objects
  - Aspects of evidence that allow for an association with a group and not with a single source
  - If objects do not agree in their class characteristics then they are of different origin
  - If objects do agree in their class characteristics then examination is extended to individual characteristics



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## The Significance of Physical Evidence

### Class and Individual Characteristics

#### Individual Characteristics:

- Make possible an inference concerning a common source for crime scene evidence and a control specimen of known origin

#### Are attributable to:

- Natural phenomena
- Minor damage through abuse
- Serious damage through misuse
- Uneven or accidental wear

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## Class and Individual Characteristics

- The recognition and distinction between class and individual characteristics can often be very subtle.

- What is the minimum number of individual characteristics needed to tie crime scene evidence with the control evidence and what degree of probability is required to be “beyond a reasonable doubt?”



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## Class and Individual Characteristics

### Probability

- There are few statistical data bases detailing population frequencies, outside of the biological databases dealing with DNA and serological evidence.

- Class characteristics are far more prevalent than individual characteristics.

- Most items cannot be individualized

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## Class and Individual Characteristics

- ✦ The weight, or significance, accorded to physical evidence depends upon:
  - ✦ The experience of the forensic scientist
  - ✦ The demeanor of the expert witness
  - ✦ The ability of the expert to explain how valid the evidence is
  - ✦ How much weight and significance the trier of fact gives to the evidence

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## The Role of the Crime Lab in Investigations

- ✦ The lab is seldom able to determine the criminal, solely on the basis of the lab work. This is the job of the investigator
- ✦ Problems between investigators and the lab may result from:
  - ✦ Lack of knowledge
  - ✦ Failure to collect evidence
  - ✦ Uncertainty of what is evidence
  - ✦ Overestimation of the lab's capabilities
  - ✦ No local lab or limited local lab capabilities

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## The Role of the Crime Lab in Investigations

- ✦ The best that one can hope for is:
  - ✦ Linking the crime scene or victim to the criminal
  - ✦ Establishing a crime element
  - ✦ Proving or disproving an alibi
  - ✦ Inducing admissions or confessions
  - ✦ Exonerating the innocent
  - ✦ Providing expert testimony
  - ✦ Discovering the truth

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