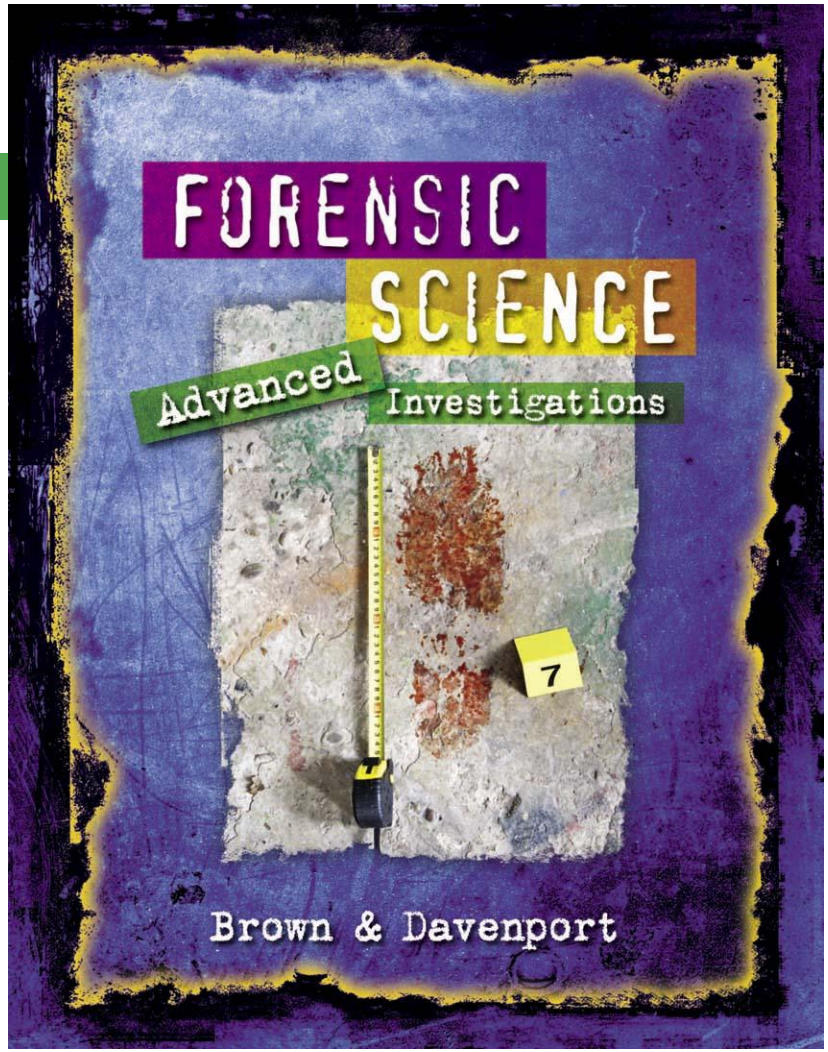
Chapter 1

Overview of Forensics



Introduction—Objectives

1. Define forensic science.
2. Describe the significance of the key contributors to the field of forensics.
3. Explain how forensic science relies on multiple disciplines to solve crimes.
4. Describe how the scientific method is used to solve forensic science problems.
5. Describe the search methods used to search a crime scene.

Introduction—Objectives

6. Describe proper techniques for collection and packaging of physical evidence.
7. Distinguish between class and individual evidence.
8. Discuss the importance of significant cases that have impacted forensic science.
9. Outline the steps of the judicial process from identification of a suspect through the trial.

Introduction—Vocabulary

- **chain of custody** - a list of all people who came into contact with an item of evidence
- **class characteristics** - properties of evidence that can be associated only with a group and never a single source
- **Frye Standard** - rule of admissibility of evidence; evidence, procedures, and equipment presented at trial must be generally accepted by the relevant scientific community
- **individual characteristics** - properties of evidence that can be attributed to a common source with an extremely high degree of certainty

Introduction—Vocabulary

- **Locard's exchange principle** - when two objects come into contact with one another, a cross-transfer of materials occurs
- **physical evidence** - any object that can establish that a crime has been committed or can link a suspect to a victim or crime scene
- **reference sample** - a sample from a known source used for comparison, also referred to as *exemplar*
- **scientific method** - a series of logical steps to ensure careful and systematic collection, identification, organization, and analysis of information

Murders at the Mansion

- The Menendez brothers - Lyle (21) and Erik (18)
- August 20 1989 — the brothers' story is that they went out for the evening
- The brothers call 911 at 11:47 to report the murder of their parents
- After paying debts, there's a $2 million estate
- By end of year, the brothers spent half of the estate
- Arrested in March 1990; indicted on Dec 8, 1992
- Defense admits brothers killed their parents, but claims sexual, physical, and emotional abuse

Historical Development (Obj 1.2)

- **Alphonse Bertillon (1853–1914) —** developed the first method of criminal identification
- **Sir Edward Richard Henry (1850–1931) —** developed a fingerprint identification system that categorized fingerprints by whorl, loop, or arch pattern
- **Karl Landsteiner (1868–1943 —** discovered blood groups
- **Edmond Locard (1877–1966) —** founder of the Institute of Criminalistics at the University of Lyon in Lyon, France

Historical Development (Obj 1.2)

- **Calvin Goddard (1891–1955) —** invented the comparison microscope
- **Rosalind Franklin (1920–1958) —** studied the molecule's structure using X-ray diffraction photography of DNA
- **James Watson (1928–) and Francis Crick (1916–2004) —** using Franklin's photography, constructed a structural model of DNA
- **Alec Jeffreys (1950–) —** invented DNA fingerprinting

A Multidisciplinary Approach (Obj 1.3)

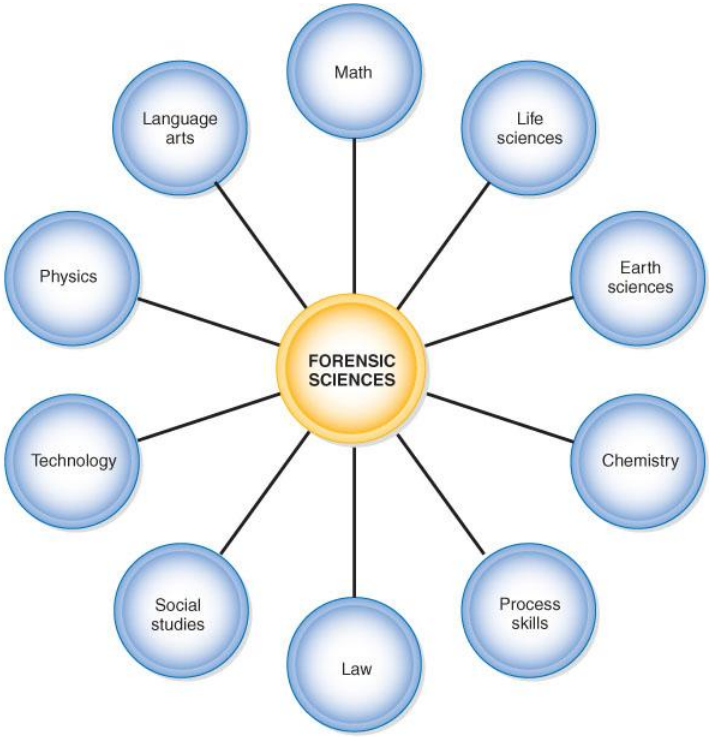


Figure 1-7. *Forensic science is a multidisciplinary subject.*

Examples:

Forensic nurse

Forensic chemist

Forensic toxicologist

Forensic meteorologist

Forensic accountant

The Scientific Method (Obj 1.4)

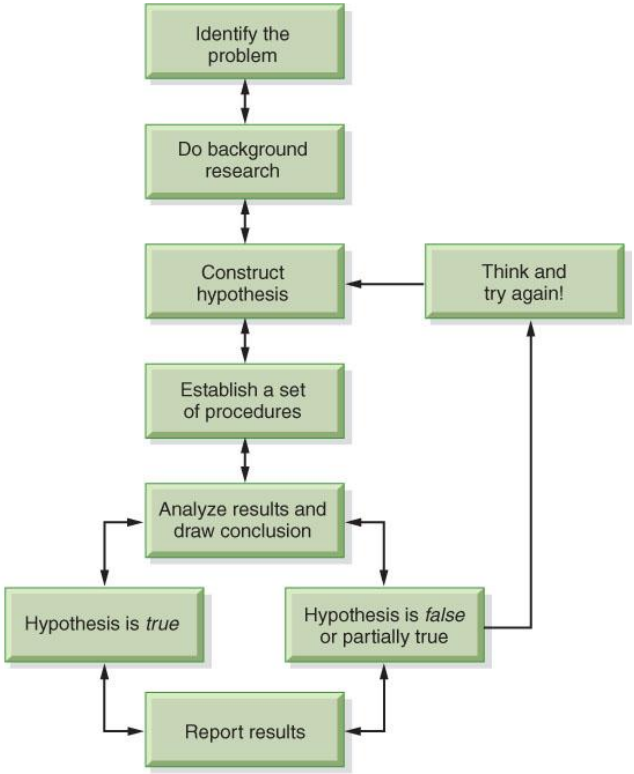


Figure 1-8. *The scientific method.*

The CSI Team and Crime Labs
(Obj 1.5, 1.6, 1.7)

The crime-scene investigation team is a team of legal and scientific experts who work together to process a crime scene and evaluate the evidence

The CSI Team and Crime Labs

(Obj 1.5, 1.6, 1.7)

Field Investigative Unit	Crime Lab Scientists
• Secure the crime scene	• Receive/sign for evidence
• Photograph the crime scene	• Review paperwork
• Search the crime scene	• Complete chemical and/or physical tests on evidence
• Properly collect and package evidence	• Complete an analysis of the findings
• Complete proper forms	• Provide expert testimony
• Evidence submission form	
• Chain of custody	
• Deliver or ship evidence to proper processing site	
• Provide expert testimony	

Figure 1-9. *Responsibilities of the crime-scene investigation team.*

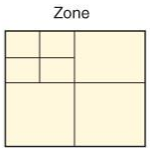
The CSI Team and Crime Labs

(Obj 1.5, 1.6, 1.7)

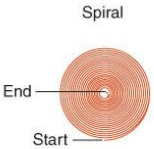
Processing a Crime Scene

Investigators choose the search method based on the size and location of the crime scene

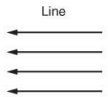
Zone: building or other structure—homicide, home invasion, robbery, sexual assault, etc.



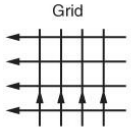
Spiral: large area, no barriers—open field—kidnapping, homicide



Line search: large area looking for a large object in a single direction—site of a plane crash



Grid: large area looking for a large object in two directions—arson investigation



The CSI Team and Crime Labs

(Obj 1.5, 1.6, 1.7)

- **Testimonial evidence** — the witness testimony used to build a timeline of events
- **Physical evidence** —any material collected or observed at a crime scene that could link potential suspects to a crime
- What is *Chain of Custody*?

Evidence

- **Chain of Custody**
  - Provides documentation of every person who has come into contact with the evidence
  - A paper trail
  - Demonstrates to the courts that the evidence that is being presented at trial is free of contamination, alteration, or substitution

Evidence

- *Trace* Evidence
- *Reference* samples
- *Class* characteristics
- *Individual* characteristics

Evidence

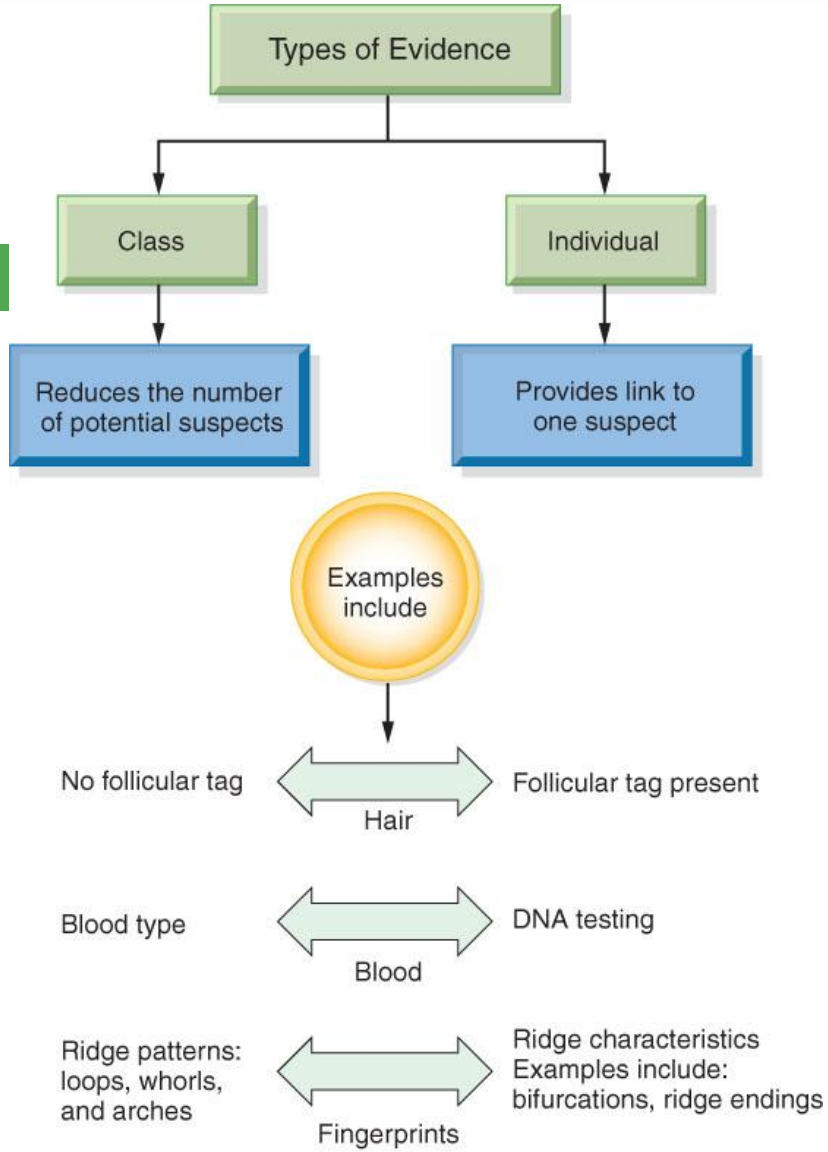


Figure 1-16. *Individual and class evidence.*

Landmark Cases (Obj 1.8)

Frye v. United States (1923)

The Frye Standard — evidence, procedures, and equipment presented at trial must be generally accepted by the scientific community

Landmark Cases (Obj 1.8)

Daubert v Merrell Dow Pharmaceuticals (1993)

U.S. Supreme Court ruled that the trial judge had ultimate decision-making power regarding expert testimony at trial

1. Has it been tested?
2. Has it been peer reviewed?
3. What is the rate of error?
4. Is it generally accepted?

Landmark Cases (Obj 1.8)

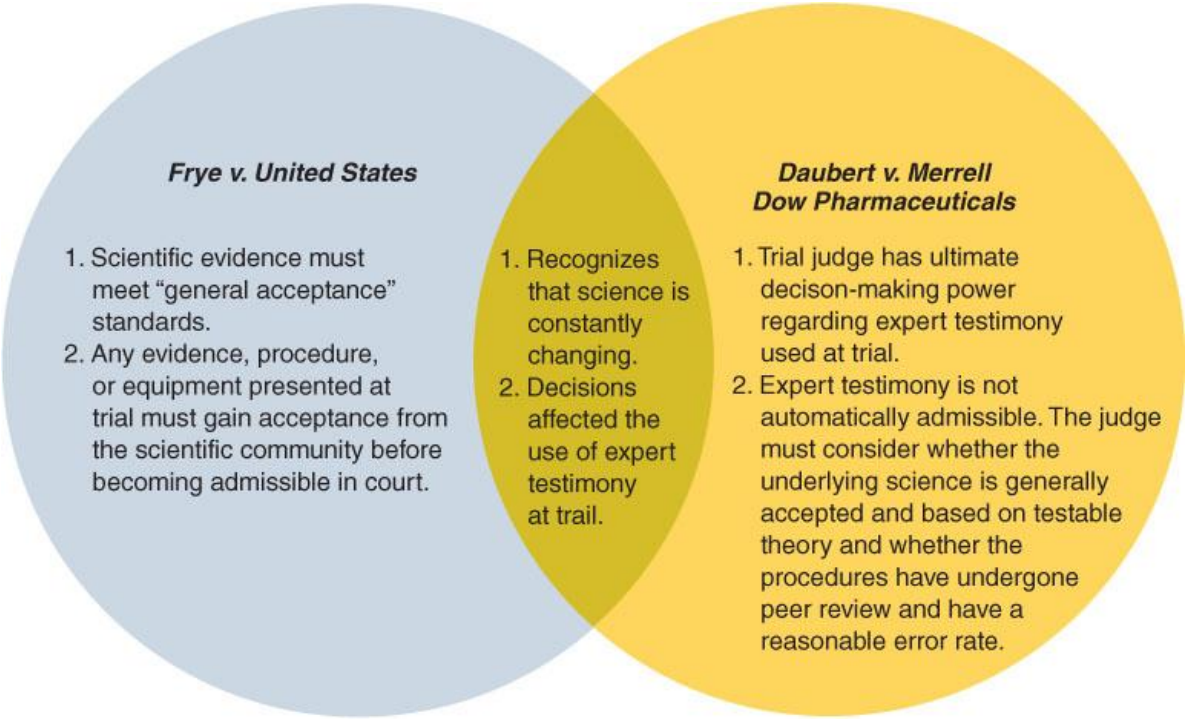


Figure 1-17. *The Frye and Daubert cases changed the way scientific evidence could be used in court.*

Landmark Cases (Obj 1.8)

Dr. Carl Coppolino (1963)

- The court ruled
  - The fact that a technique, test, or procedure is new does not necessarily mean its findings are inadmissible in court
  - The expert witness is responsible for providing scientifically valid testimony to support the findings

The Judicial Process (Obj 1.9)

- The U.S. Constitution (1787)
- The Bill of Rights (1789)
  - The first ten amendments to the constitution
  - Sixth amendment ensures that a person will be tried by an impartial jury of his or her peers

The Judicial Process (Obj 1.9)

- Arrest - gathering evidence to show probable cause
  - Observation
  - Expertise
  - Information
  - Circumstantial evidence
- Before the Trial — the discovery phase
- At the Trial — prosecution and defense present their cases

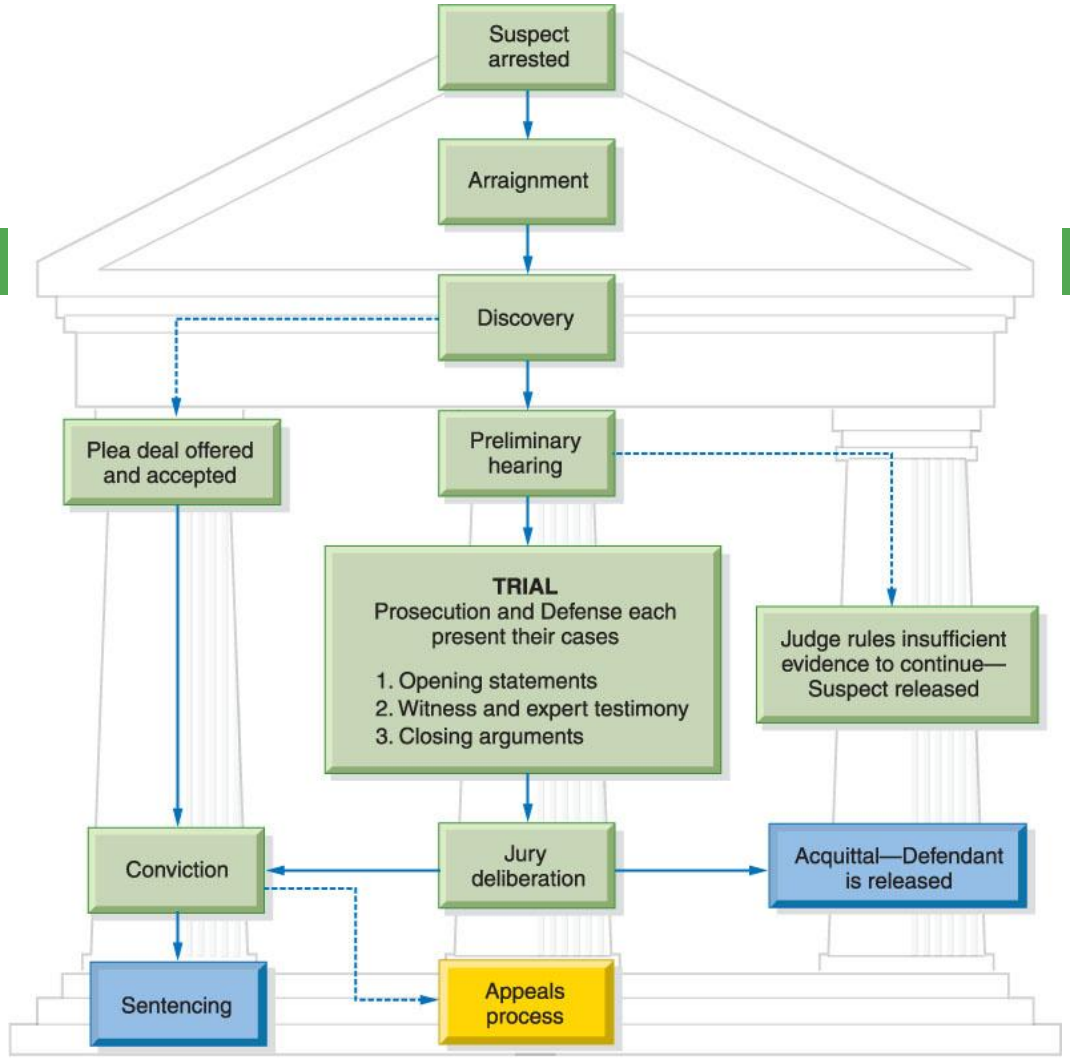


Figure 1-21. *An outline of court proceedings.*

Chapter Summary

- Forensic science is the application of science to law.
- Many disciplines are utilized in forensic science.
- Processing a crime scene requires a thorough and systematic approach.
- Physical evidence is any substance that can link a potential suspect to a victim or crime

Chapter Summary

- When processing evidence, investigators use identification and comparison tests to attempt to make connections between victims, suspects, and crime scenes.
- Evidence that possesses class characteristics can be associated with a group rather than with a specific individual.
- Evidence that possesses individual characteristics can be associated with a single person with a high degree of certainty.

Chapter Summary

- A chain of custody is necessary to maintain the integrity of the evidence.
- The judicial process in the United States is based on the U.S. Constitution.
- Law enforcement personnel must prove probable cause before a judge will sign a search or arrest warrant.
- In court, a jury of the suspect's peers hears evidence from both sides.